

(TBI)

Traumatic brain injury

* Common in male > 3:1

* leading cause of death in people < 30y

* mortality rate = 20-25 %

* TBI mainly due to motor vehicle accidents, assaults

* Causes of TBI //

1 RTA (> 50%)

2 falls

3 violence and fire arm

4 sport injuries

5 explosive blasts and other combat injuries

6 Suicide

* People at risk of TBI //

1 Children

2 young adult

3 unmarried

4 elderly adult (> 65y) brain atrophy, dementia

5 male 3:1

6 alcohol intoxication

(TBI)

* Scalp injury ← علاقة مع

✓ scalp wound جرح قشري بالscalp

✓ subgaleal hematoma

aponeurosis, periosteum

✓ Cephalohematoma → more deep

bone, periosteum

* Classification of TBI //

Closed

opened

fall, motor vehicle crashes

applied bullet, wound

✓ local damage or diffuse axonal damage

✓ largely local damage

✓ effects tend to be broad (diffuse)

✓ effects can be serious

✓ no penetration to skull

✓ penetration of skull

* Classification of skull fracture //

1) depressed / non depressed (linear)

✓ depression bone

2) open / closed

✓ bone location

3) skull base fracture

± CSF leak (rhinorrhea, otorrhea)

4)

skull

~

±

Cranial nerve Palsy

* Signs of Skull Fracture //

- ① Raccoon eye ← orbit & ecchymosis
- ② Battle sign ← mastoid area & retroauricular
- ③ Cranial N. Palsy ← intact side as mouth & IF facial palsy
- ④ otorrhea ← discharge of CSF from ear
- ⑤ rhinorrhea ← " " " nose

* head injury

bruising, swelling, fracture, scalp wound, loss of consciousness, stiff neck, nasal discharge

* TBI

headache, vertigo, vomiting, confusion, impaired conscious, anisocoria
 vision changes, paralysis, poor coordination, cognitive impair
 speech difficulty, seizure
 L> pupil F. 1F, Rt

(Classification of TBI according severity)

mild

moderate

severe

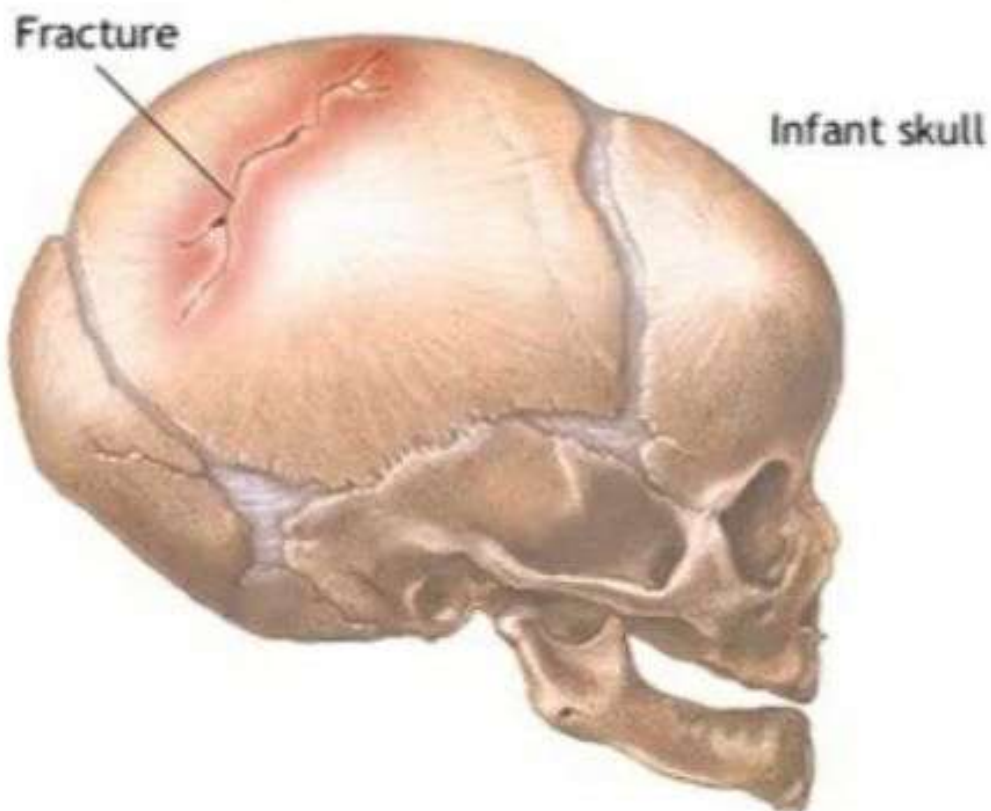
GCS 13-15

9-12

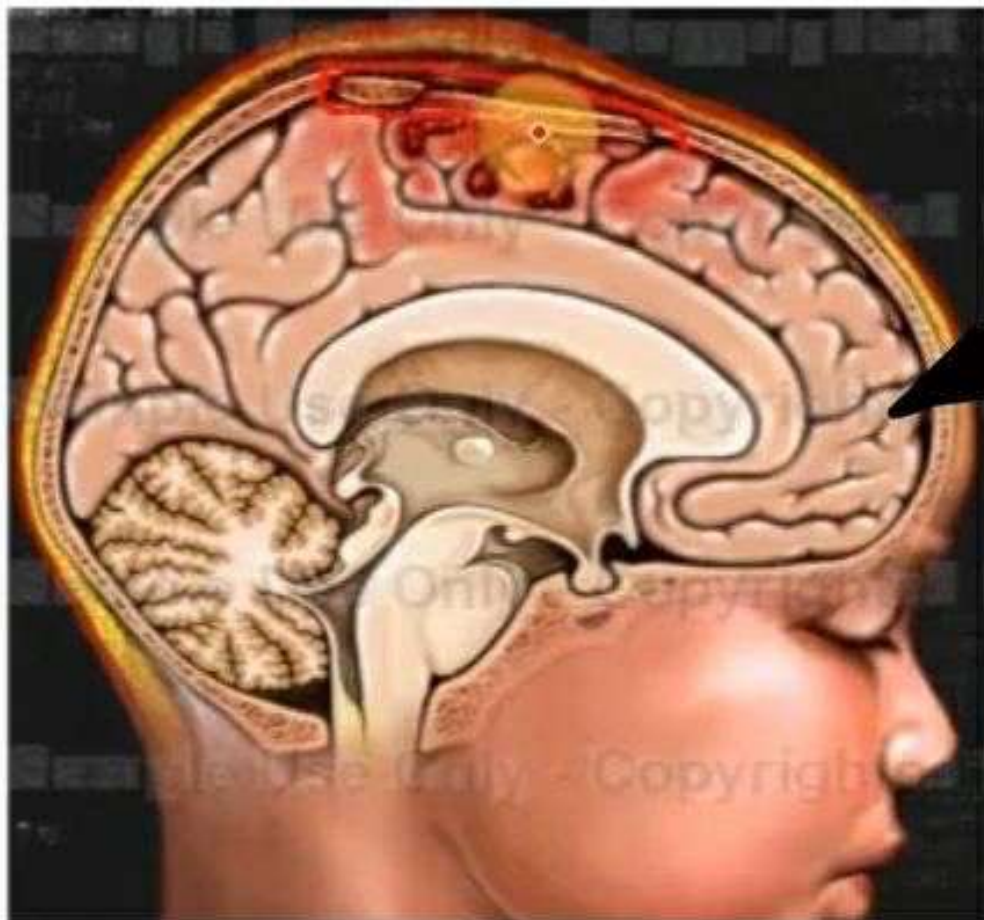
3-8

TBI ~ 7.80 Sign ← mild TBI *

- headache, nausea, vomiting, fatigue or drowsy
- loss consciousness for few sec to few min (< 30 min)
- Brief change in mental status: amnesia to the event



Linear Skull Fracture



Depressed Skull Fracture

Signs of Skull Base Fracture



Raccoon eyes



Battle sign "Mastoid ecchymosis"



Cranial nerve palsy

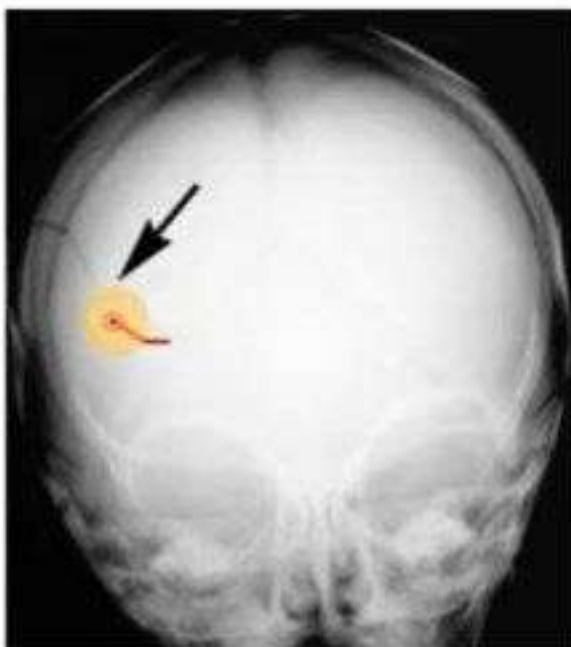


Otorrhea

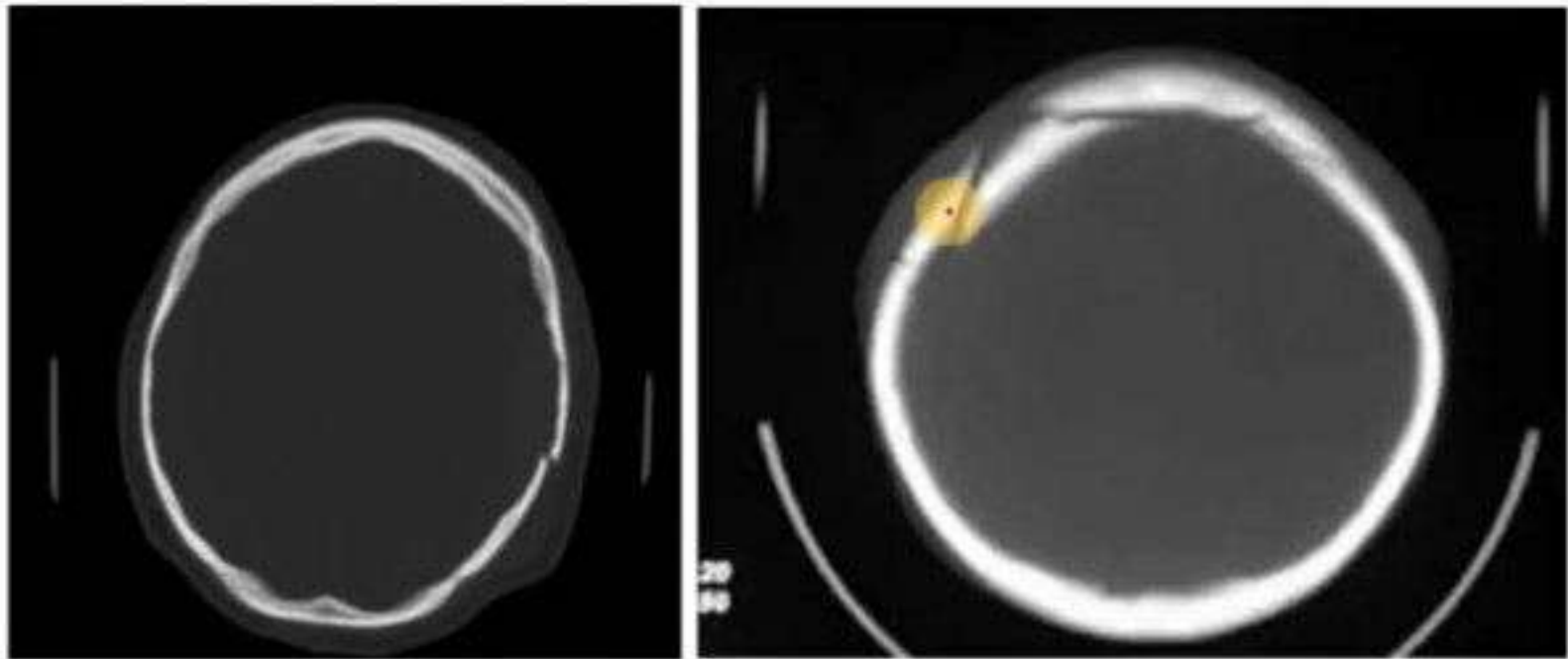


Rhinorrhea

Linear Skull Fractures: X-ray



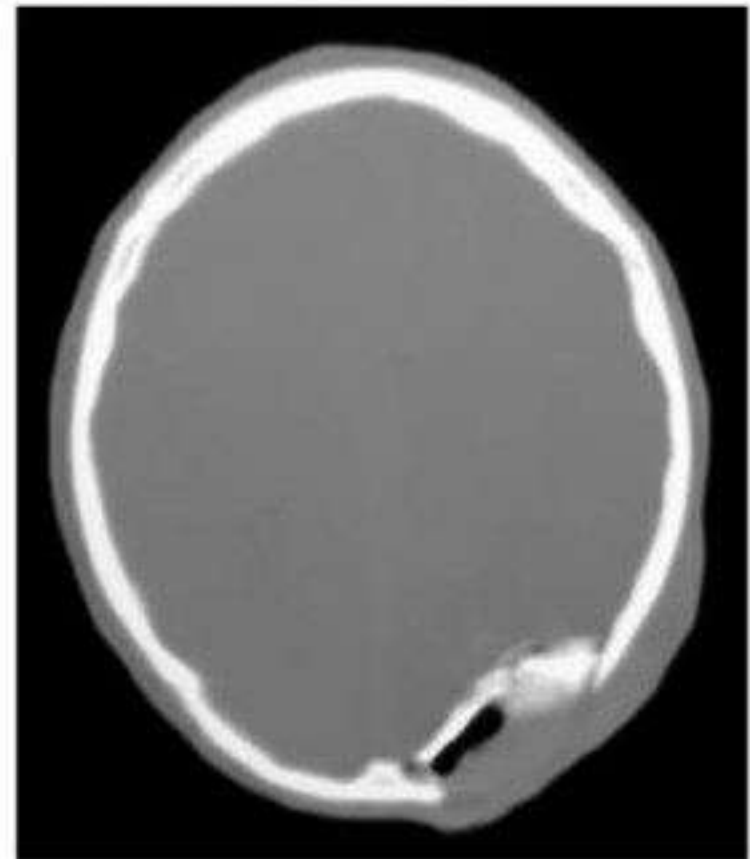
Linear Skull Fractures: CT- Bone Window



Depressed Skull Fracture: CT

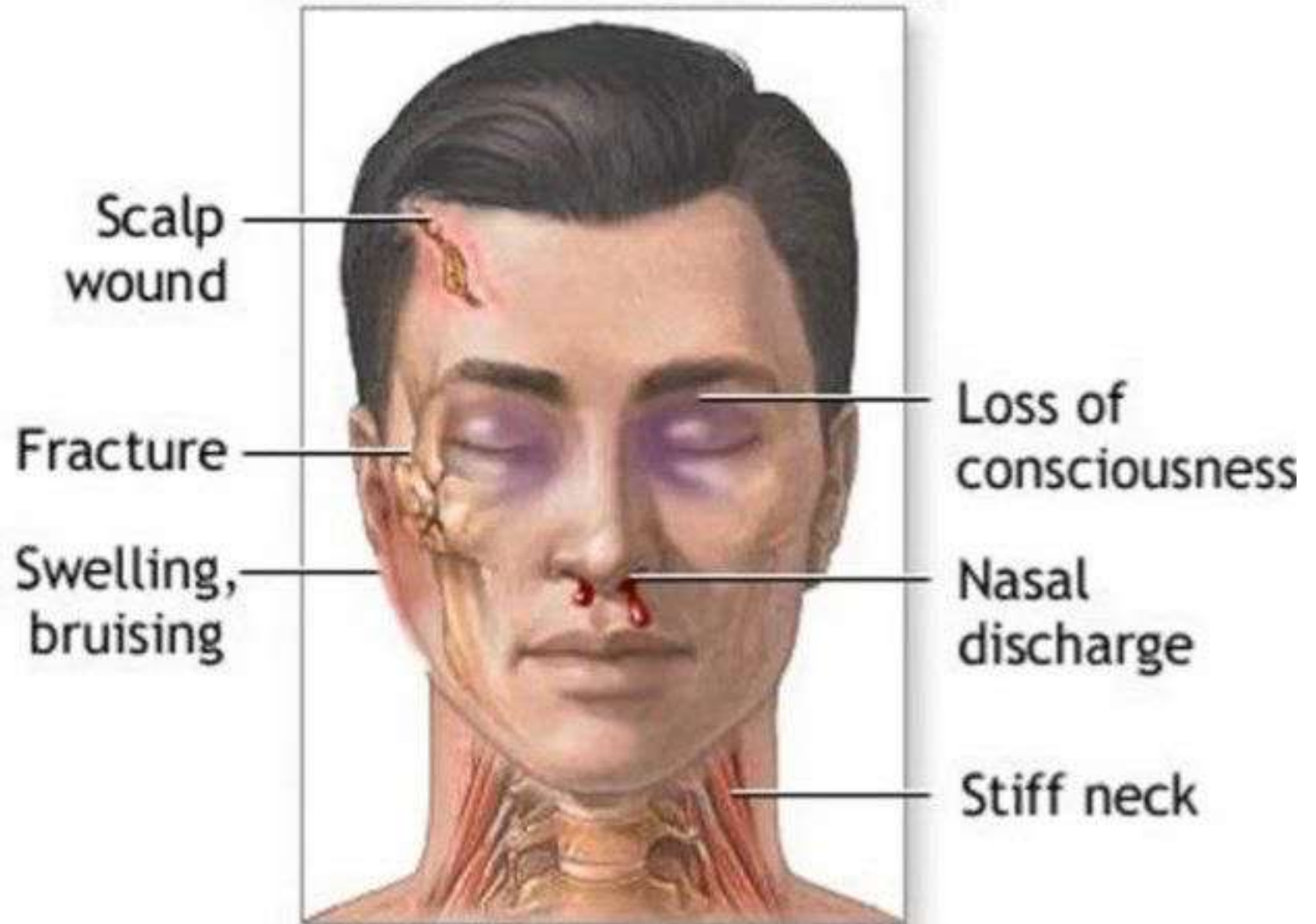


CT- Brain Window



CT- Bone Window

Indications of a head injury



(7.13)

← moderate TBI *

loss consciousness (30 min - 24h)

observe admission

↓ LOC, neuro deficit, frequent neuro exam

(moderate TBI) CT

manage as severe head injury: Deterioration

(7.1)

← Severe TBI *

Loss consciousness > 24h

intubation for airway protection

Focused neuro exam

frequent reevaluation

identically associated injuries

Classification of TBI II

(*) Local

- epidural hematoma
- subdural "
- SAH
- local traumatic intracerebral hemorrhage

(*) Diffuse cerebral pancyphoma

- Concussion
- Diffuse axonal injury
- multiple brain contusions
- hypoxic / ischemic injury

in deep coma CT

autopsy, MRI

stretching tract/fibers

micro hemorrhage in brain tissue

(Epidural Hematoma)

✓ skull fractures , skull , dura
✓ (laceration of middle meningeal artery)
✓ acute arterial bleeding

✓ CT : hyperdensity of **lenticular biconvex or lens shape**

⤵️ ملاحظة: شكل العدسة ، Compression داخل brain tissue

✓ early craniotomy and evacuation essential if volume of hematoma $> 30 \text{ cm}^3$
or midline shifting $> 1 \text{ cm}$

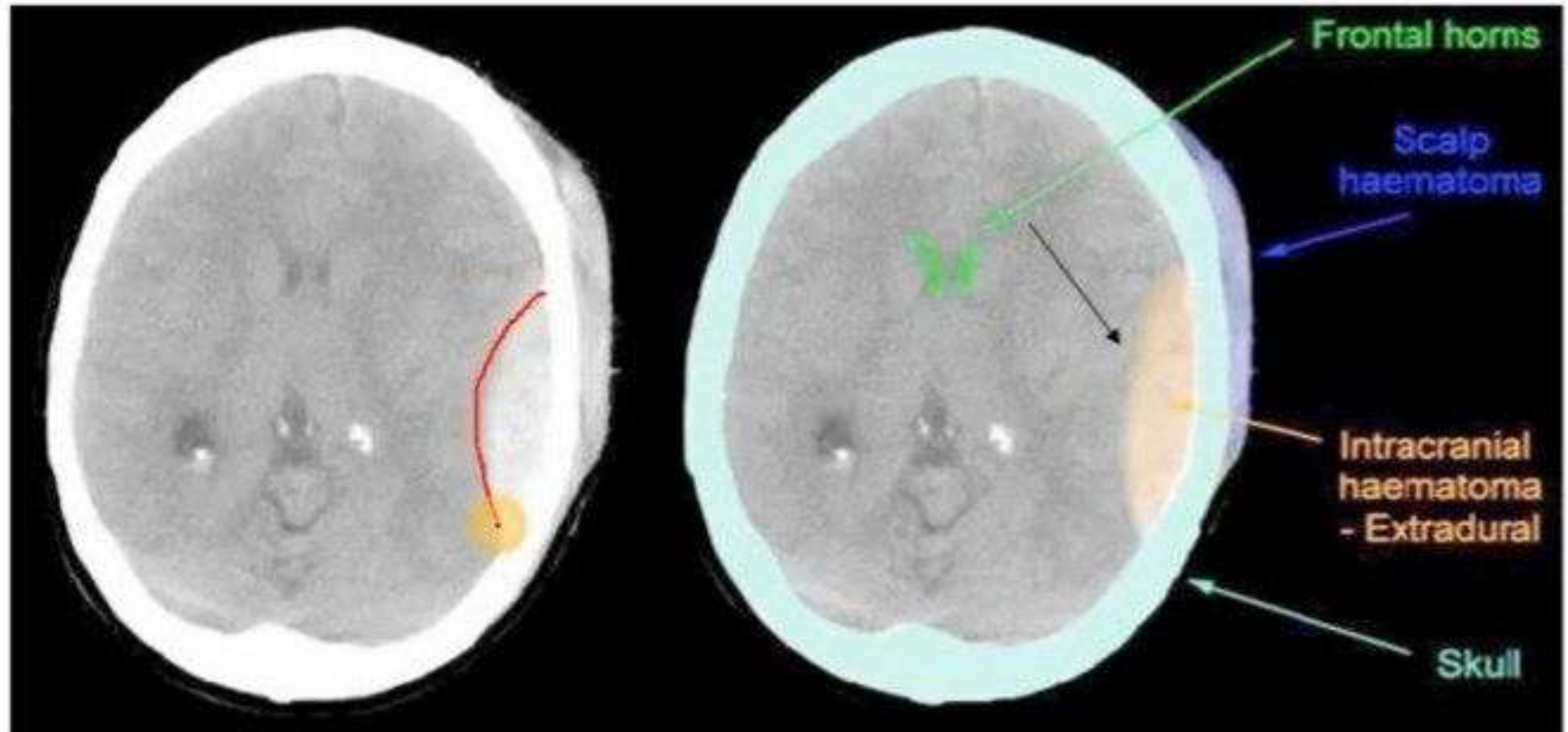
* Epidural H. : الخط بين skull و dura
Subdural H. : الخط بين dura و brain
adherent skull و dura ، skull و dura
skull غير ملتصق بالمخ ، brain و skull

(Subdural hematoma) "SDH"

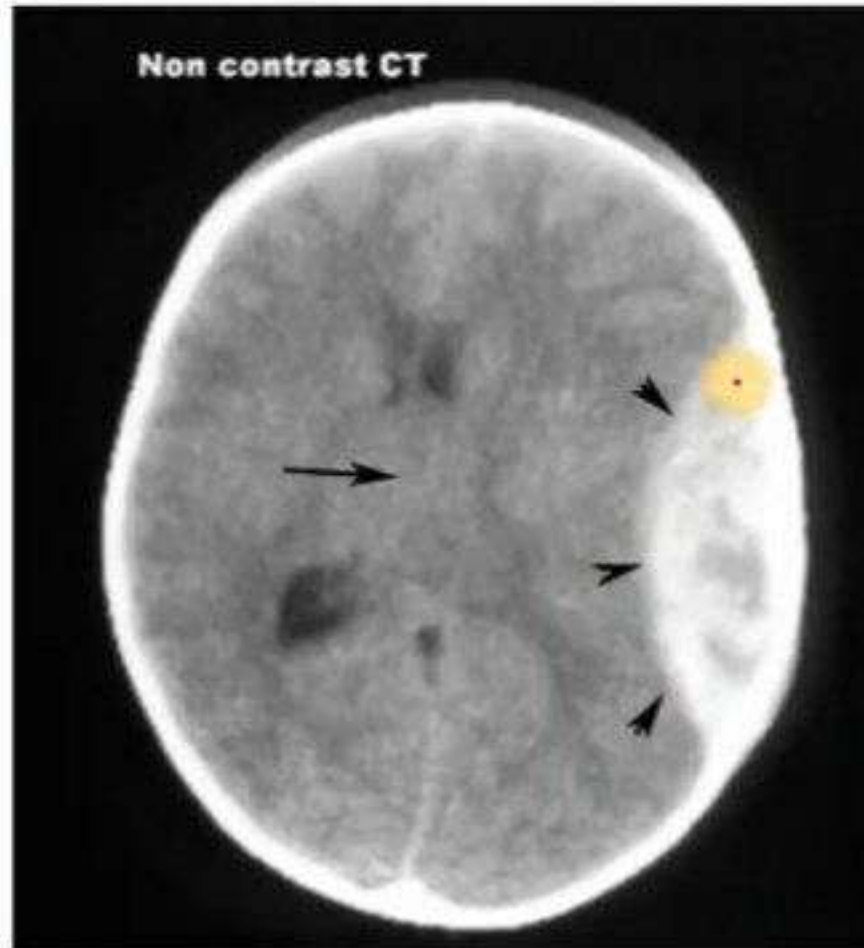
✓ دقة ناعمة : brain laceration , Venous tear
✓ "تحت بطن" : dura , arachnoid , و بين بطن و dura adherent
✓ شكل الهلال / العدسة : **Crescent-shaped** CT : hyperdensity
Crescent لها تفرع : hemispheric convexity
✓ **acute** : hyperdense
✓ **subacute** : isodense
✓ **chronic** : hypodense
✓ rapid surgical : $> 5 \text{ mm}$ shift of midline and

✓ thickness of hematoma $> 10 \text{ mm}$

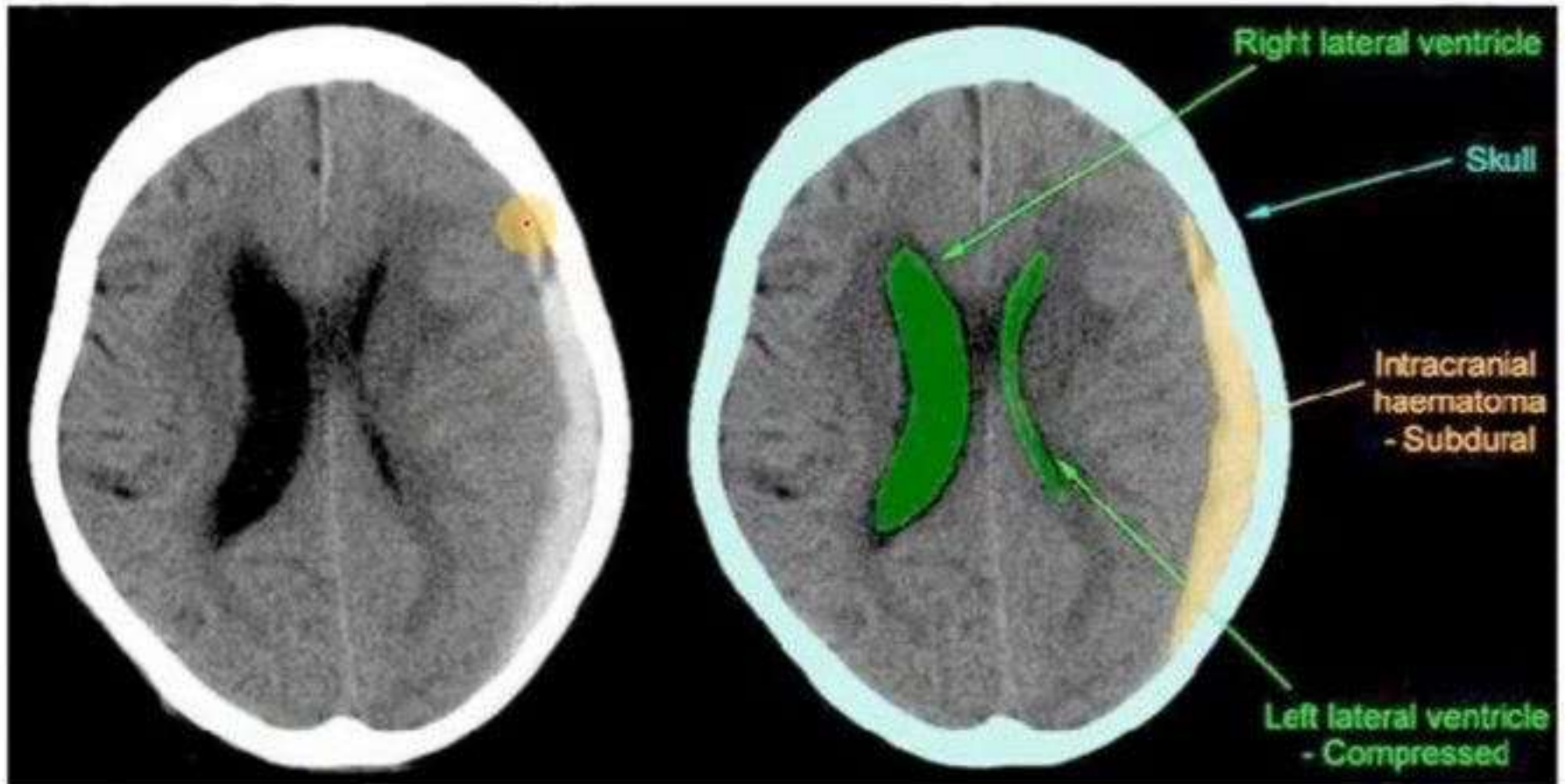
Epidural Haematoma



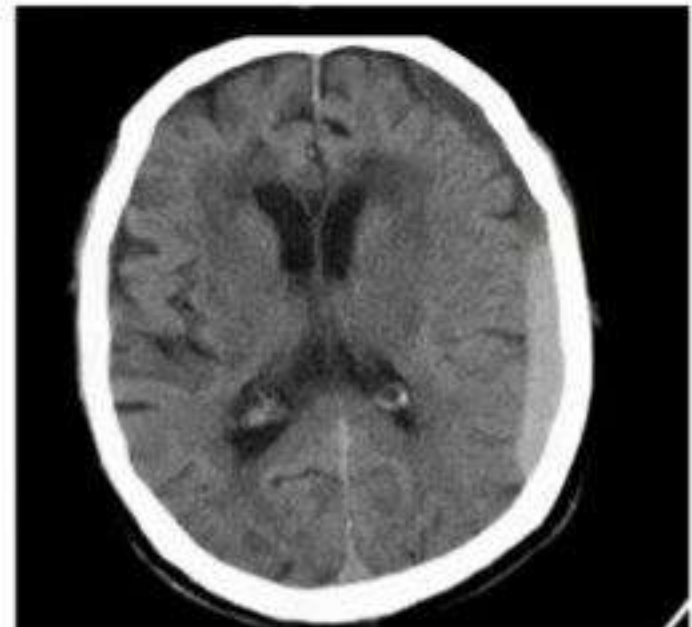
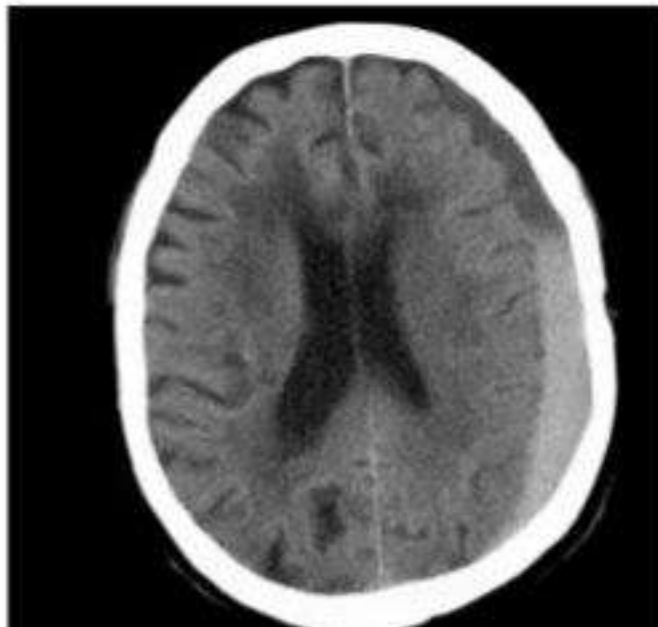
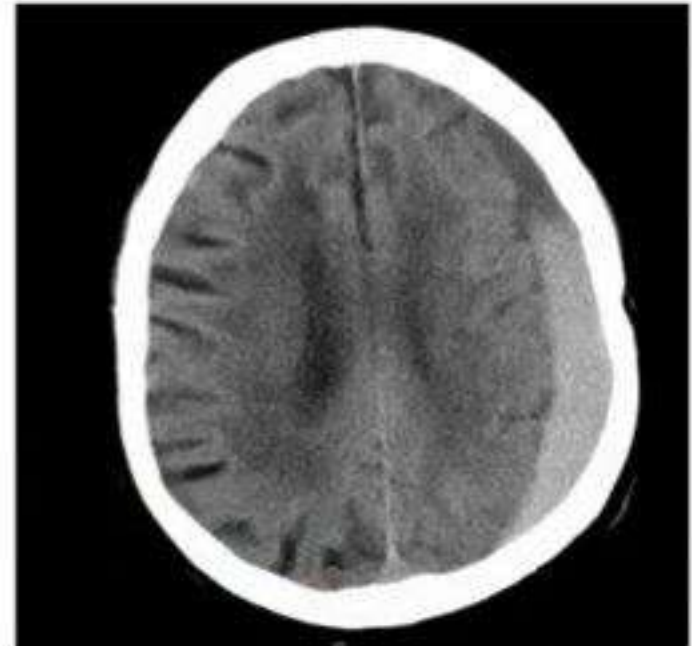
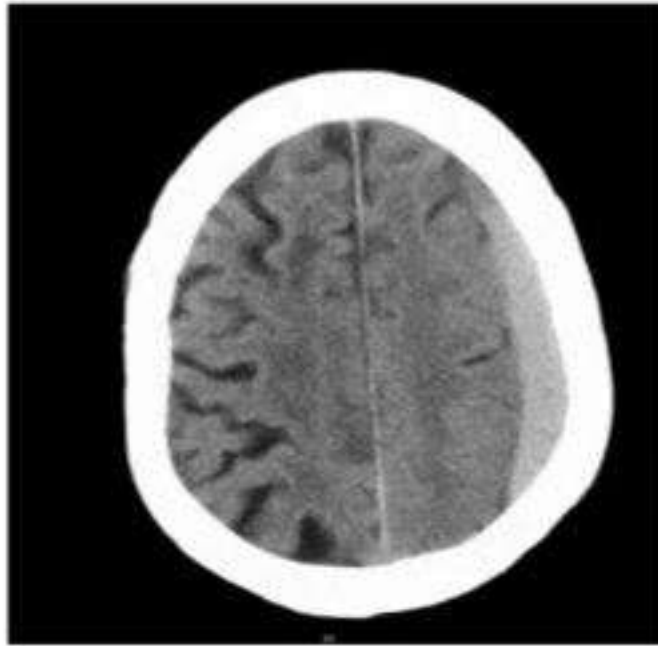
Epidural Haematoma



Acute Subdural Haematoma



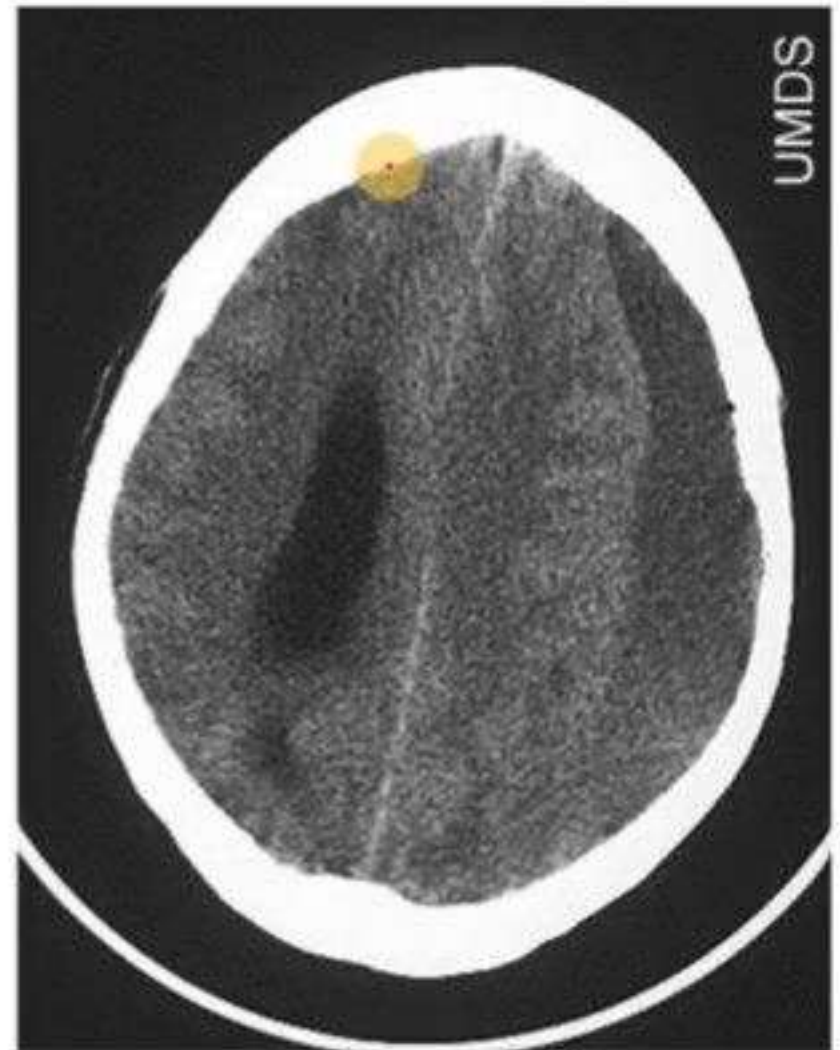
Acute Subdural Haematoma



Subdural Haematoma



Subacute Subdural Hematoma

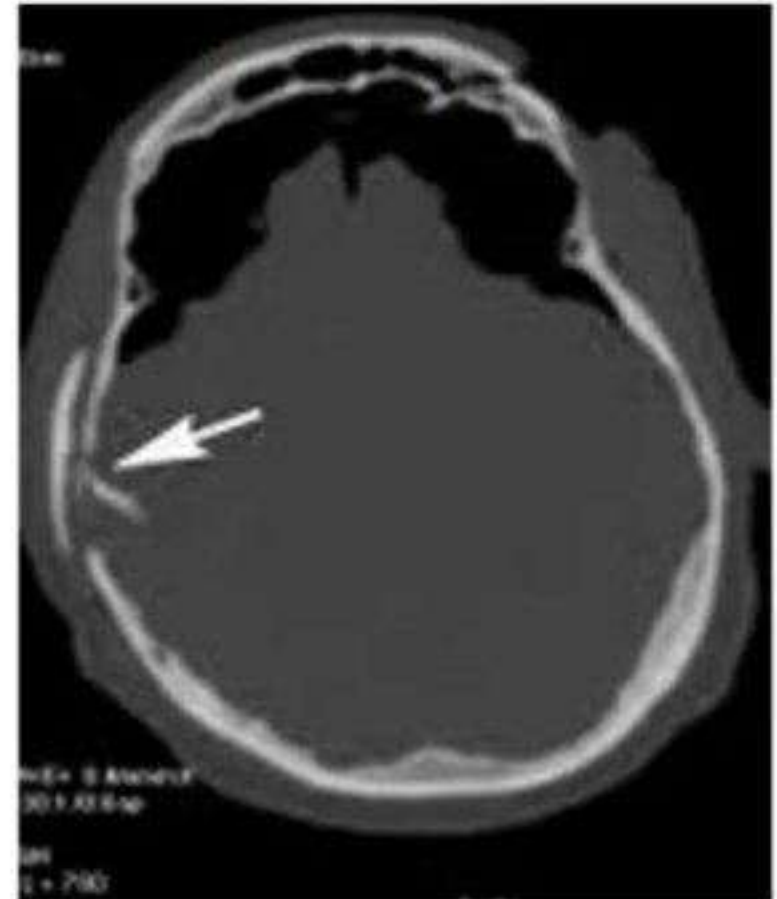


Chronic Subdural Hematoma

Pneumocephalus: CT



CT- Brain Window



CT- Bone Window

(Traumatic Subarachnoid hemorrhage)

Severe headache, nausea, repeated projectile vomiting, Vertigo : pia & arachnoid
Confusion, coma, Convulsion, ⊕ meningeal irritation signs
Stiff neck painful due to meningeal irritation

(intraventricular hemorrhage)

Very severe intracranial brain injury
SAH
Poor prognosis

(intraparenchymal hematoma)

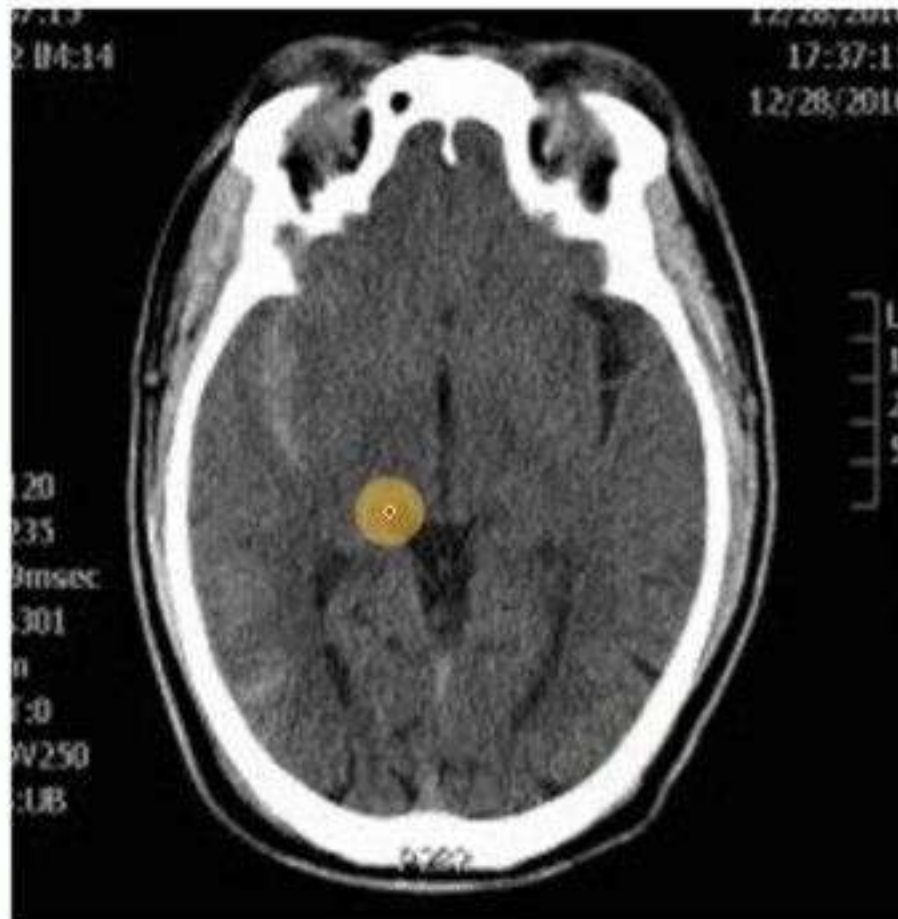
* Local collection of blood that most commonly arise from
injury to intraparenchymal cerebral vessels
basal ganglia or Temporal, frontal white matter
Intracerebral bleeding is injury BV
TBI

(Brain Concussion)

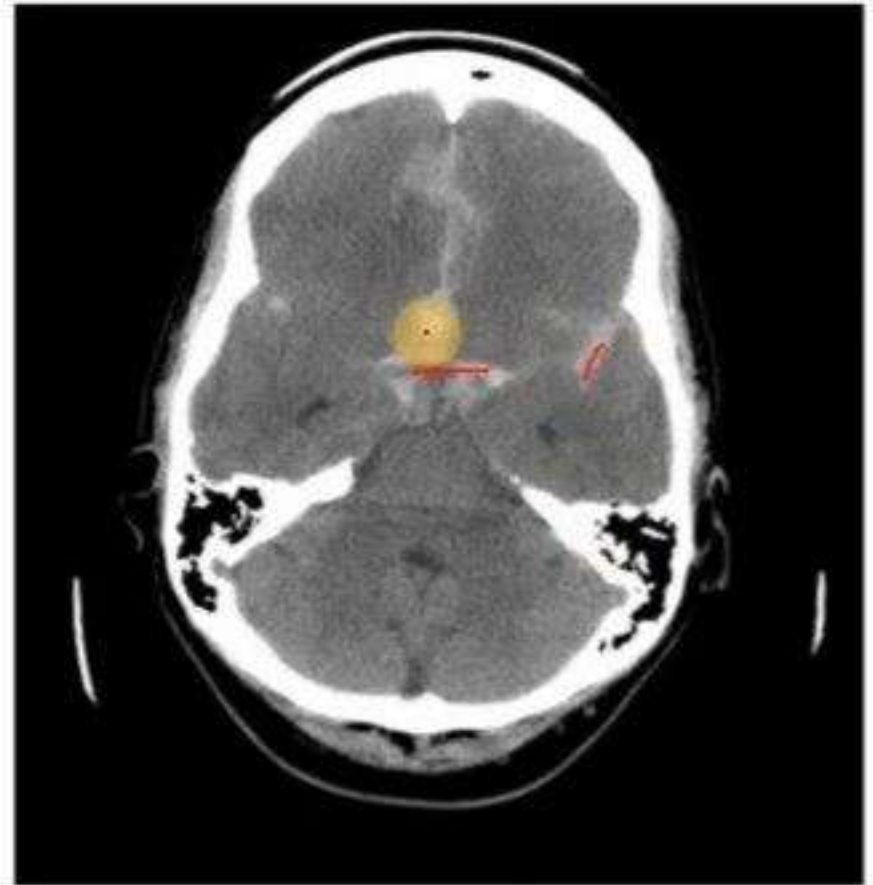
(most common type of head injury) mild TBI
brain tissue damage
MRI, CT
headache, vertigo, confusion, Transient loss consciousness / Clinical manifestation
Transient amnesia

Spontaneously

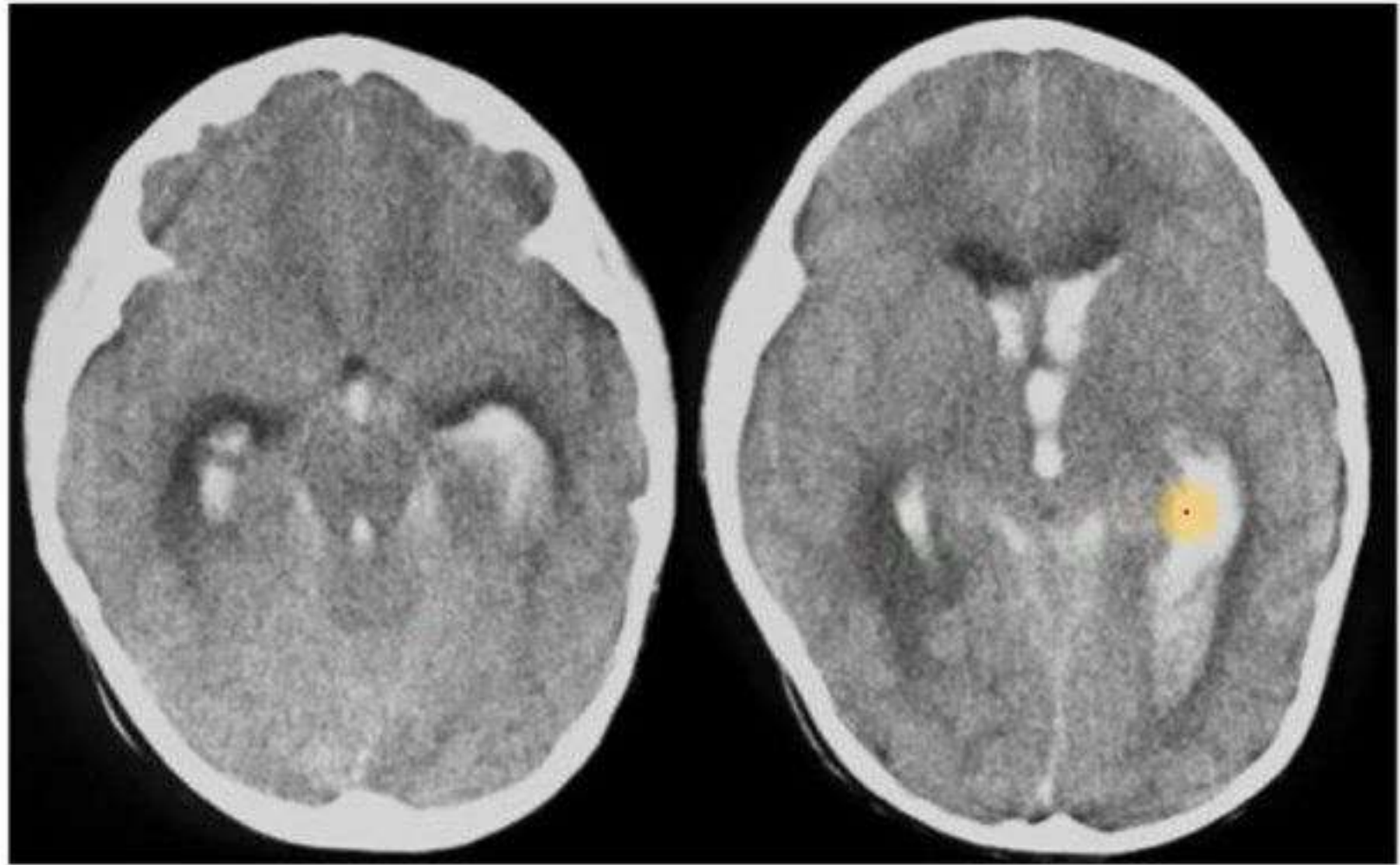
Traumatic Subarachnoid Hemorrhage



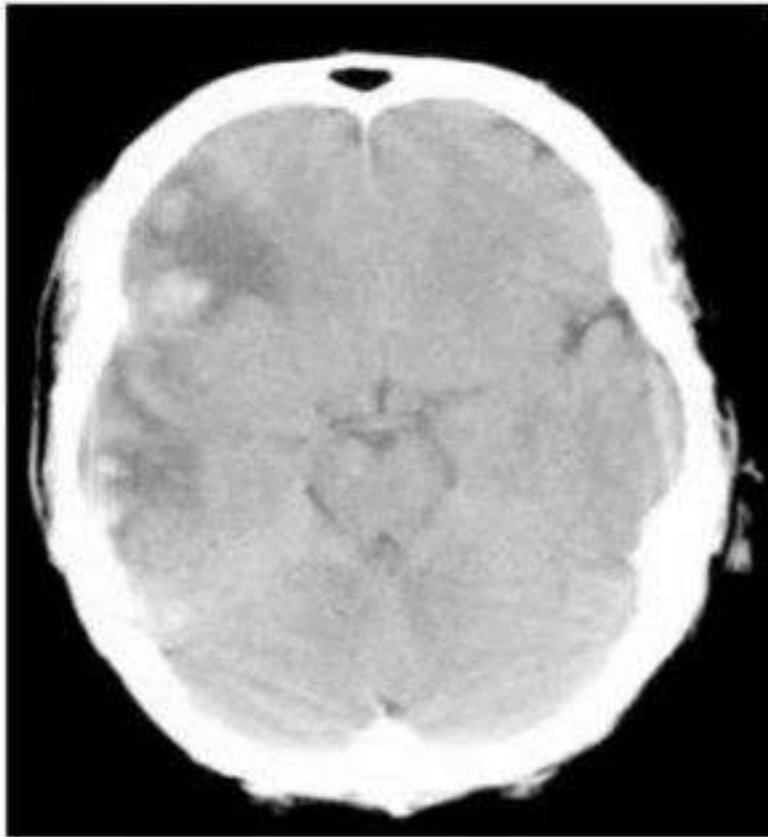
Traumatic Subarachnoid Hemorrhage



Intraventricular Hemorrhage



Brain Contusion



(Brain contusion)

- ✓ ردة مع نزيب الدماغ
- 1) * most common location: frontal lobe, Temporal lobe
- 2) Cortex ← Superficial grey matter
- 3) hemorrhage ← 1.50
- ✓ bleeding, Contusion, edema ← يزيد في الأولى من الأوقات
- ✓ CT ← تغير خلال الوقت الأولى من الأوقات
- ✓ CT changes usually progressive
- ✓ most conscious patient : no operation
- ✓ loss conscious ← severe

(Diffuse axonal injury)

- ✓ microhemorrhage, white matter hypoxia, axonal swelling
- ✓ MRI, CT ← abnormal
- ✓ Severe loss consciousness, Prolonged coma

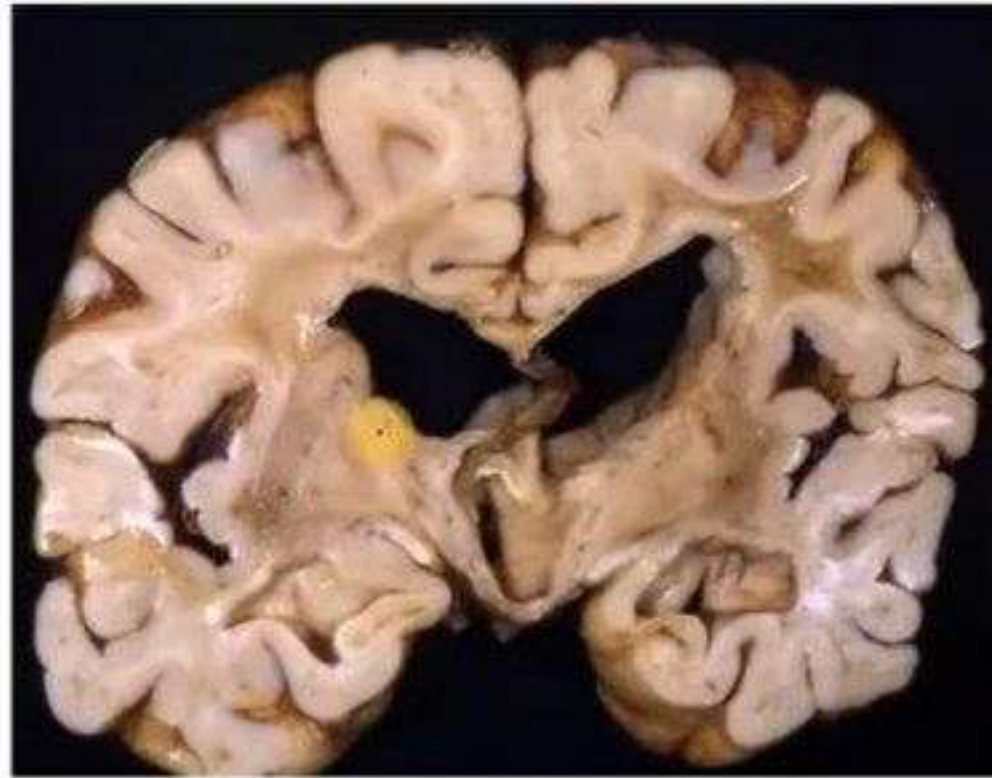
* intracranial H.W ? ↑ ICP

- Concussion Papilloedema Severe headache rising B.p
- Blurred vision repeated vomiting Slowing respiration Slowing pulse rate (brady Cardia)

(warning signs)

- ✓ inability to awaken the patient
- ✓ Severe headache
- ✓ Seizure
- ✓ Concussion
- ✓ Progressive neuro deficit
- ✓ vision difficult
- ✓ vomiting, fever, stiff neck
- ✓ urinary or bowel incontinence

Diffuse Axonal Injury



* indication for hospital admission /

- 15 > GCS (1)
- Cerebral edema, intracranial bleeding: abnormal CT (5)
- Neuro. deficit (4)
- Seizure (4)
- Depressed skull fracture (6)
- Persistent headache or Vomiting (4)
- anemia, low CBC WBC abnormal bleeding parameter (4)

* investigation s

- ✓ CBC → abd. bleed is, Polytrauma → drop Hg (1)
- ✓ Blood chemistry → hypoglycemia (1)
- ✓ Toxin screening (1)
- ✓ X-ray skull, spine, chest, abd. US (1)
- ✓ CT Brain + Cervical spine (1)
- ✓ Brain MRI for diffuse axonal injury (1)

* CT 1st choice for dx TBI → without contrast

→ Fast, available, sensitive to acute SAH, skull fracture.

CT is a diagnostic tool for pathologic injuries → TBI → Brain CT →

- 1) skull fracture
- 2) epidural hematoma
- 3) subdural "
- 4) subarachnoid hemorrhage
- 5) intraparenchymal "
- 6) cerebral contusion
- 7) intraventricular hemorrhage
- 8) focal and diffuse patterns of axonal injury with cerebral edema

* indication for CT //

injury // GCS ≤ 15 ✓

neuro. deficit ✓

Penetrating head injury ✓

Depressed skull fracture ✓

Seizure etc ✓

Severe headache ✓

episodes 2, < vomiting ✓

> 65 < ✓

min 30 < retrograde amnesia ✓

to or rhinorrhea, Battle sign, Raccoon eye, base skull fracture sign etc ✓

* Complication of head trauma //

1) altered consciousness: com, vegetative state, brain death

2) Seizure post trauma epilepsy

3) Cranial HIN

4) post-traumatic headache

5) motor, sensory, cerebellar and speech deficit

6) post-traumatic hydrocephalus

7) meningitis

8) B.V. damage: stroke

9) Cognitive impairment: Post-traumatic dementia

10) Behavioural and emotional change: anxiety, depression

* Management of TBI //

- ABCDE
- Airway → administer O₂
 - Breathing → maintain adequate ventilation
 - Circulation → " B.P (systole > 90)
 - Disability
 - Exposure

intubation in GCS ≤ 8 →

C-spine precaution →

sterile dressing to wound

antibiotic in penetrating injury.

(Phenytoin) →

NGT, Foley Catheter →

ulcer →

rehabilitation, physiotherapy →

* Surgical Treatment //

repair d/c. 1 cm < depressed skull fracture

opening a window in skull d/c intracranial H/W, severe brain edema

skull d/c →

penetrating trauma →

evacuation intracranial or extrac. hematoma →

TBI #

7.7.2025...