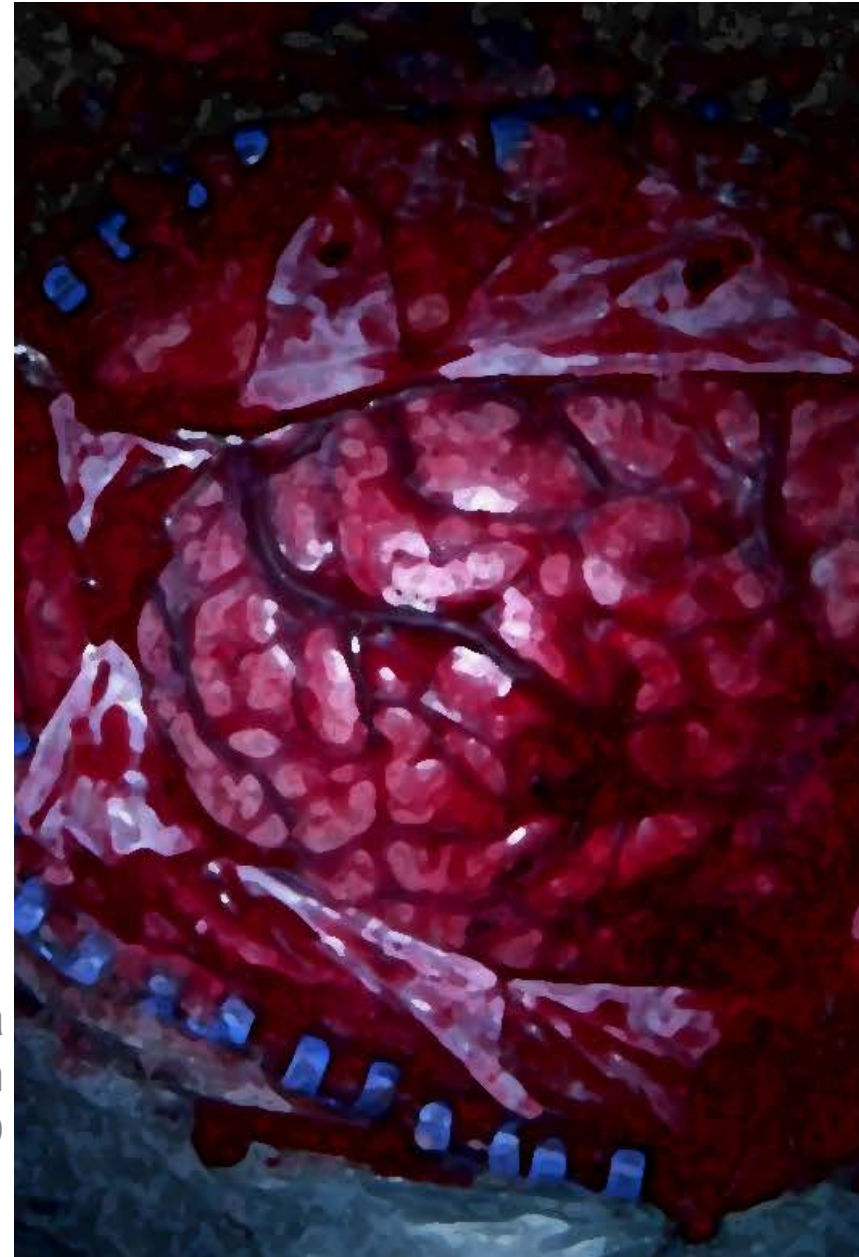


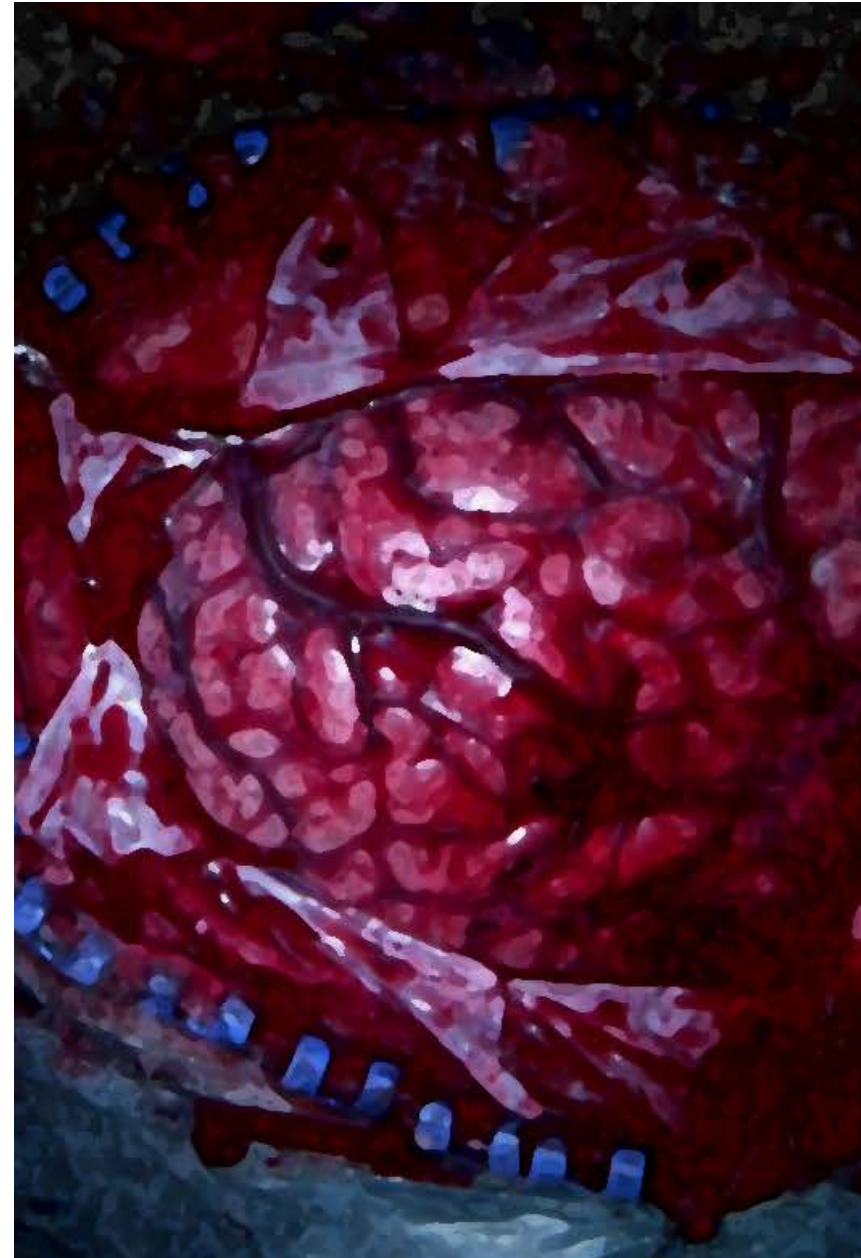
TBI
Traumatic Brain Injury

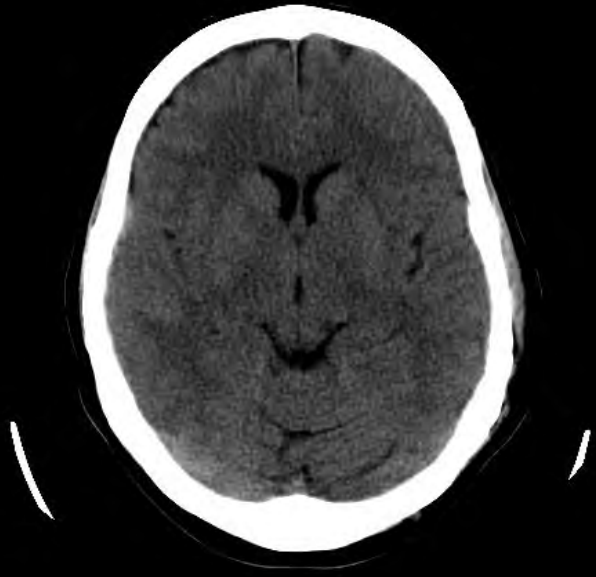
10.4 2019

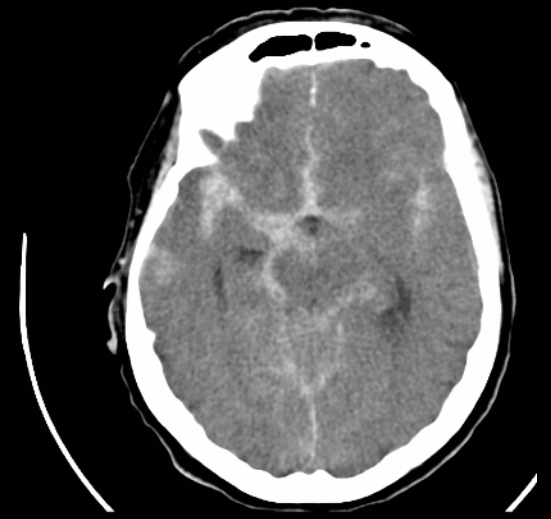
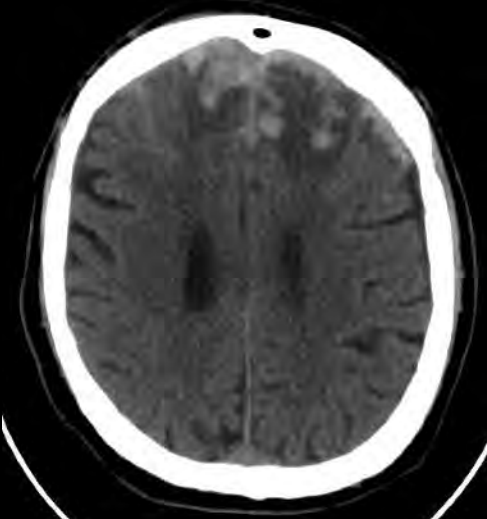
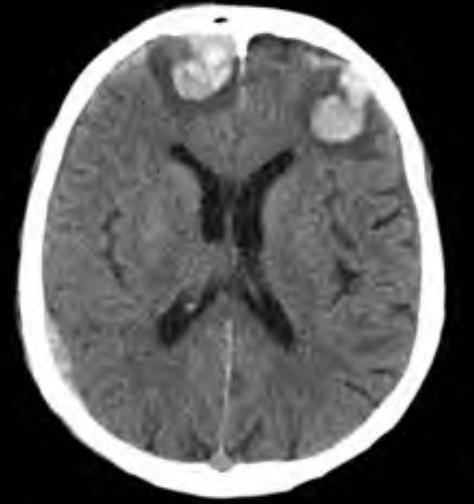
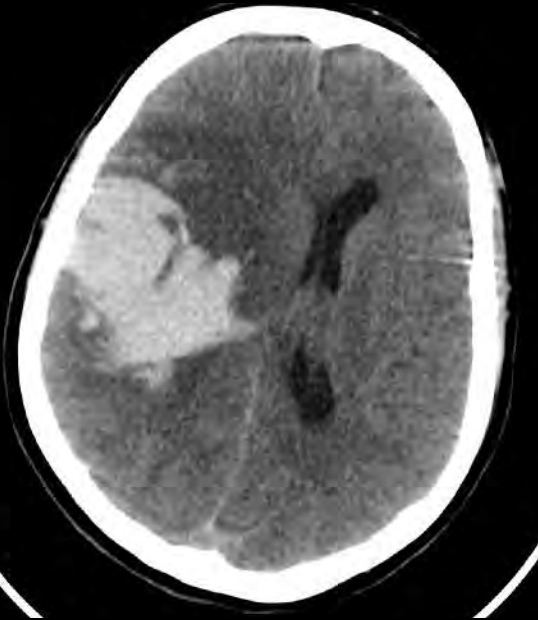
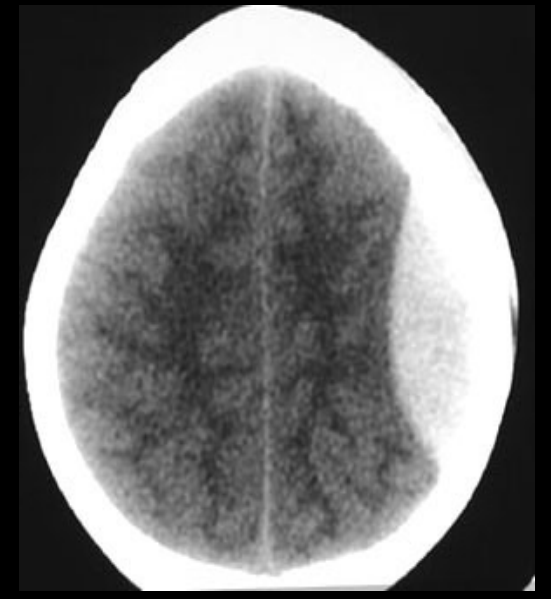
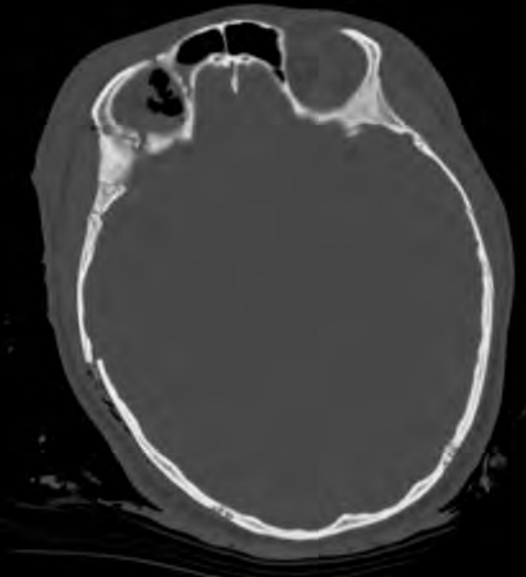
Johan Marjamaa
Neurosurgeon
MD PhD



The most complex disease of the most complex organ





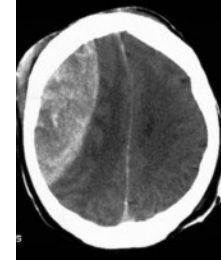


Mild TBI



vs

Sever TBI



- More usual (71-98%)
- Conservative treatment
- Symptoms of concussion may last days – weeks
- Prognosis is good
- Risk factors for persisting symptoms?
- LOC < 30min
- PTA < 24h

- Not as frequent
- Lethal
- Immediate treatment
- Outcome depends on age, motor score, pupils
- Exact outcome impossible to predict

Helsinki statistics

- Helsinki Neurosurgery
 - 300 pt/year in ICU
 - Falling is the most common mechanism 56% (vs30-60)
- Many patients are young,
- But the the incidence in the elderly is growing
- Male (55-82%)
- Alcohol 51%



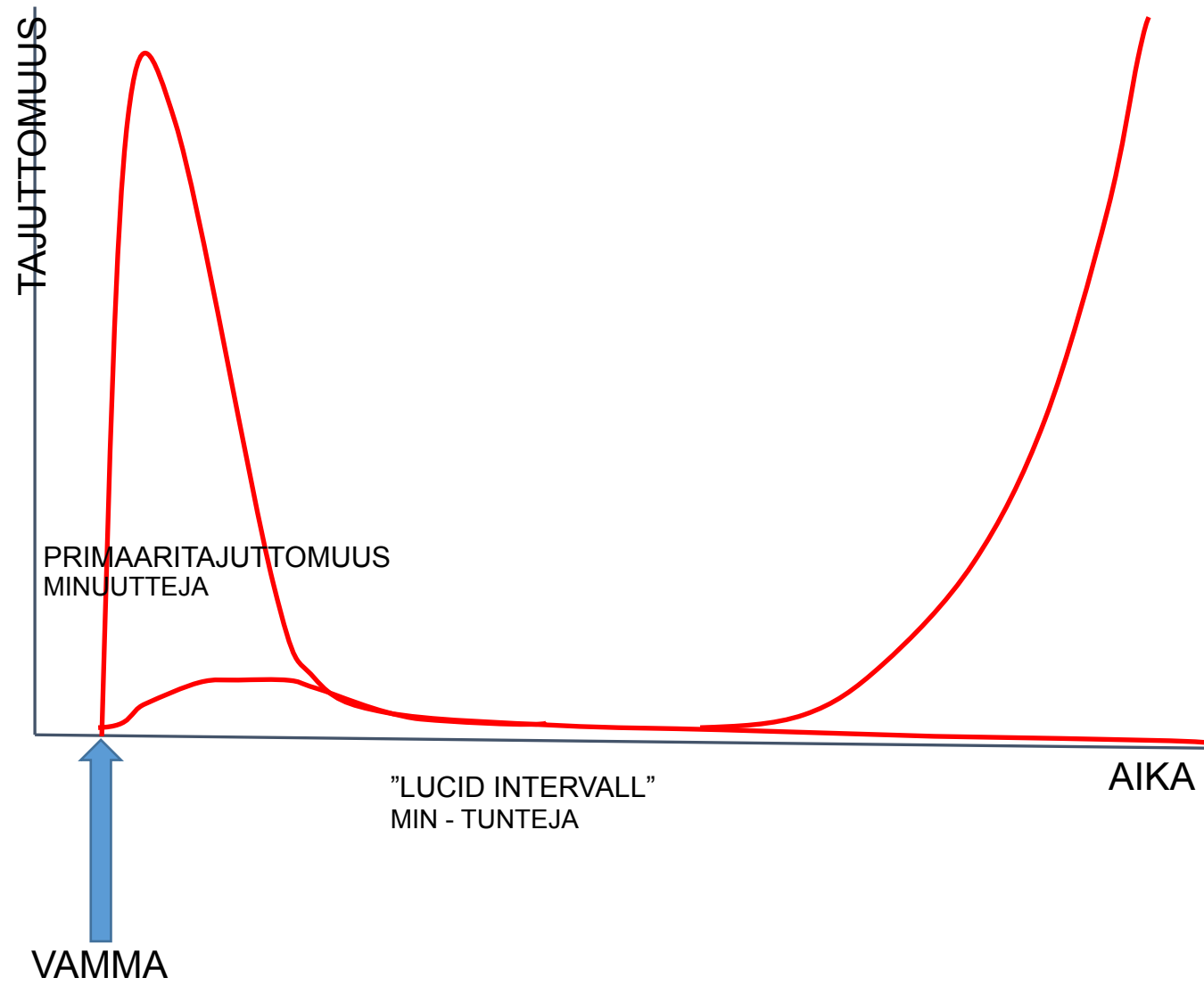


Glasgow Coma Scale

Eye Opening Response	Verbal Response	Motor Response
4 = Spontaneous	5 = Oriented	6 = Obeys commands
3 = To verbal stimuli	4 = Confused	5 = Localizes pain
2 = To pain	3 = Inappropriate words	4 = Withdraws from pain
1 = None	2 = Incoherent	3 = Flexion to pain or decorticate
	1 = None	2 = Extension to pain or decerebrate
		1 = None

Examining the patient

- History
- GCS AND follow-up
- Neurological status
- Pupils
- Other injuries
- Hb, Trom, TT-SPA, Na, K, Krea





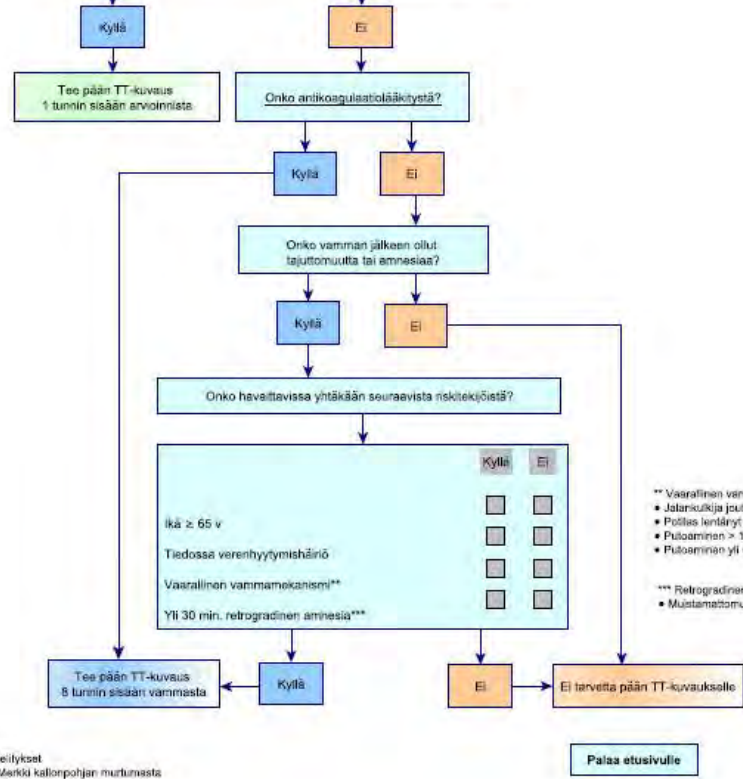
Päivystyksellisen pään TT-tutkimuksen aiheet pään vamman jälkeen

Pään vamman saanut aikuispotilas ensiavussa

Onko havaittavissa yhtäkään seuraavista riskitekijöistä?

	Kyllä	Ei
GCS < 13 vammautumisen jälkeen	<input type="checkbox"/>	<input type="checkbox"/>
GCS < 15 kaksi tuntia vammauksen jälkeen ensiavussa	<input type="checkbox"/>	<input type="checkbox"/>
Epäily avoimesta tai kasaanpainuneesta kallonmurtumasta	<input type="checkbox"/>	<input type="checkbox"/>
Merkki kallonpohjan murtumasta*	<input type="checkbox"/>	<input type="checkbox"/>
Vamman jälkeinen kouristuskohtaus	<input type="checkbox"/>	<input type="checkbox"/>
Paikallinen neurologinen puutosoire	<input type="checkbox"/>	<input type="checkbox"/>
Enemmän kuin yksi oksemusepisodi vammauksen jälkeen	<input type="checkbox"/>	<input type="checkbox"/>

- * Merkki kallonpohjan murtumasta:
- Hemolyysipainuri
 - Periorbitaalihematooma (Billion hematooma)
 - Subkutaaninen hematooma mastoideusokarostan päältä (Battle's sign)
 - Lukuvuoto nenästä jättil korvasta



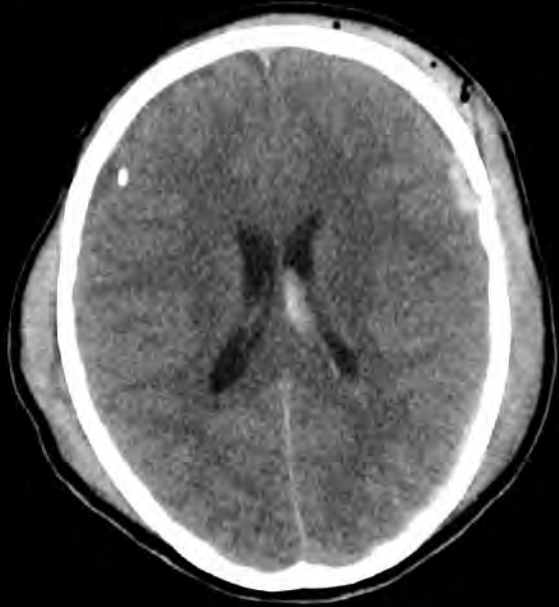
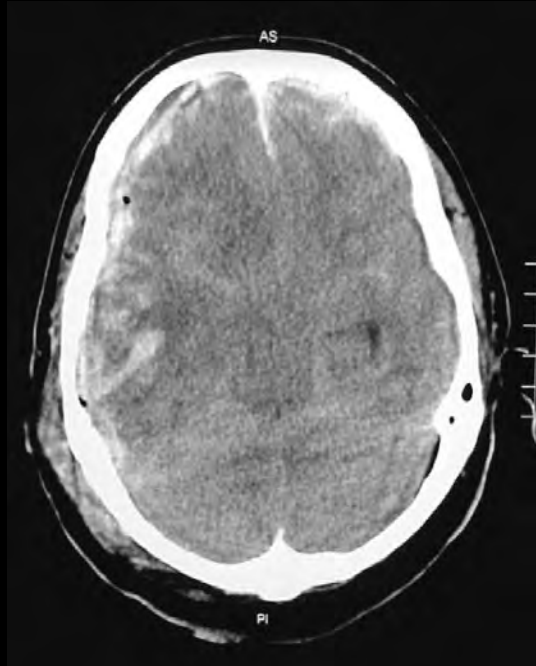
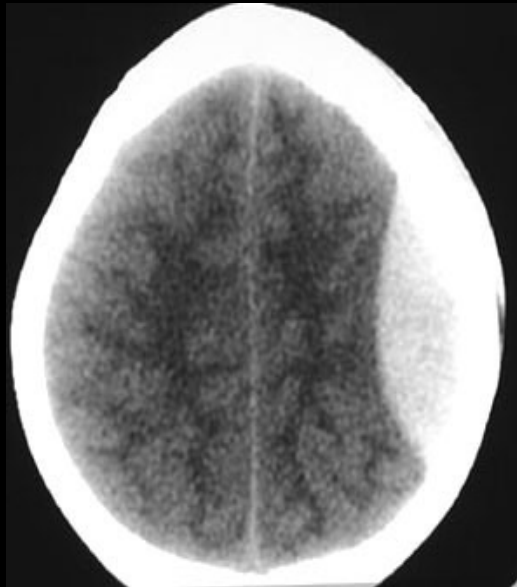
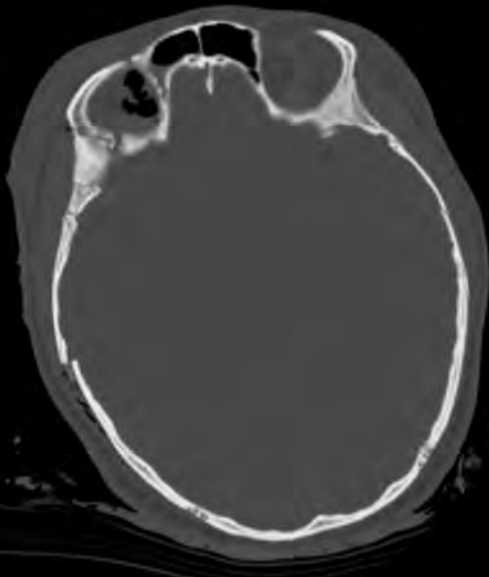
- ** Vaarallinen vammamekanismi
- Jalansukaja joutunut moottoroidun ajoneuvon työvälineeksi
 - Pölyssä lentänyt ulos ajoneuvosta
 - Putoaminen > 1m korkeudesta, tai
 - Putoaminen yli viiden portaan korkeudesta

- *** Retrogradinen amnesia
- Muistamattomuus vammaa edeltäneistä tapahtumista

Seilykset
 * Merkki kallonpohjan murtumasta
 ** Vaarallinen vammamekanismi
 *** Retrogradinen amnesia

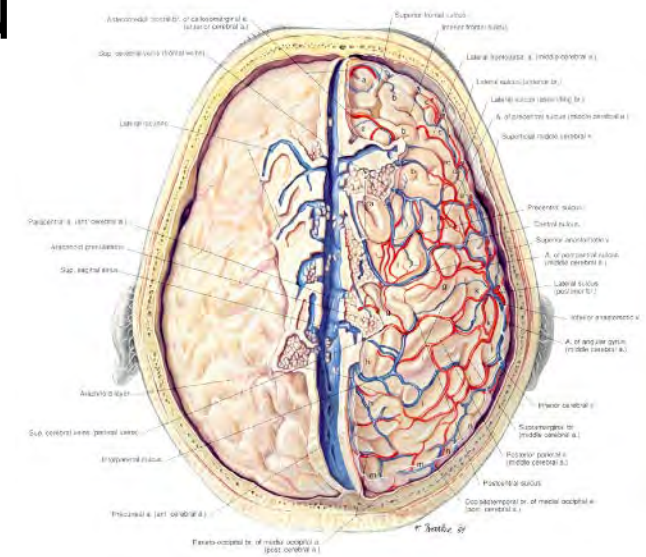
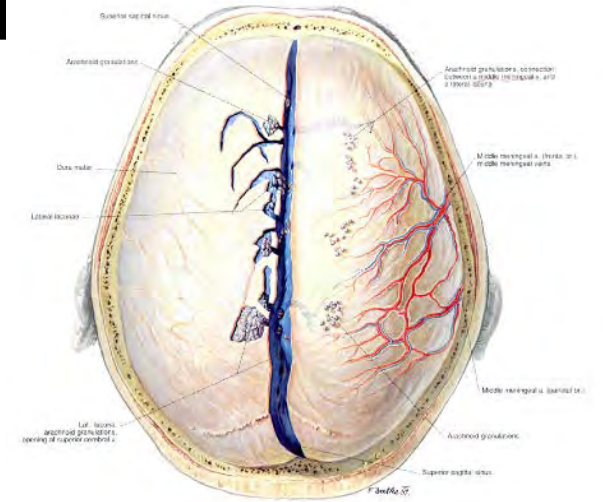


AE



What happens with the brain

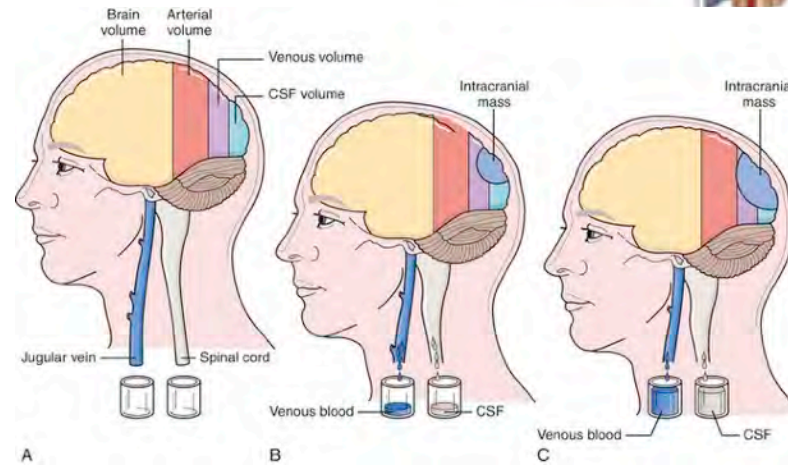
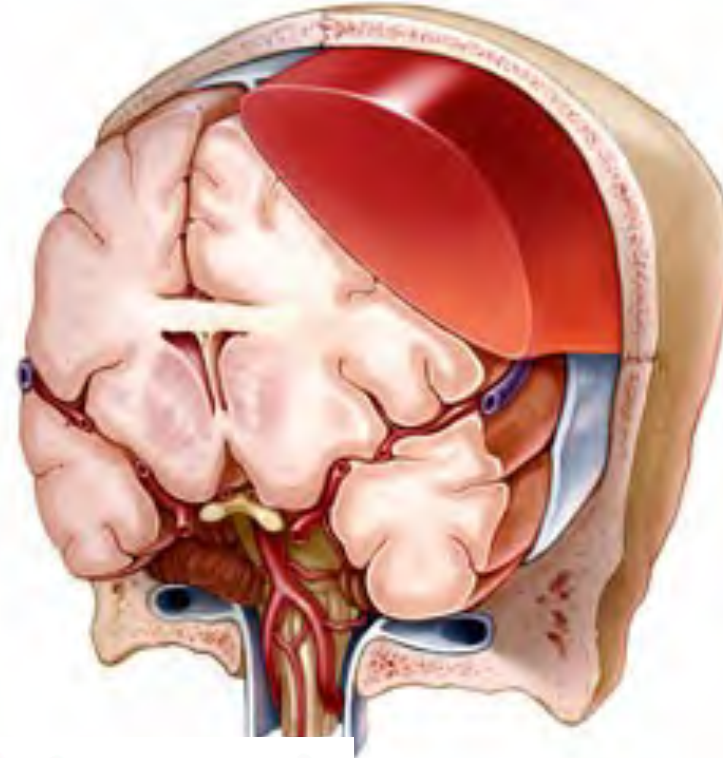
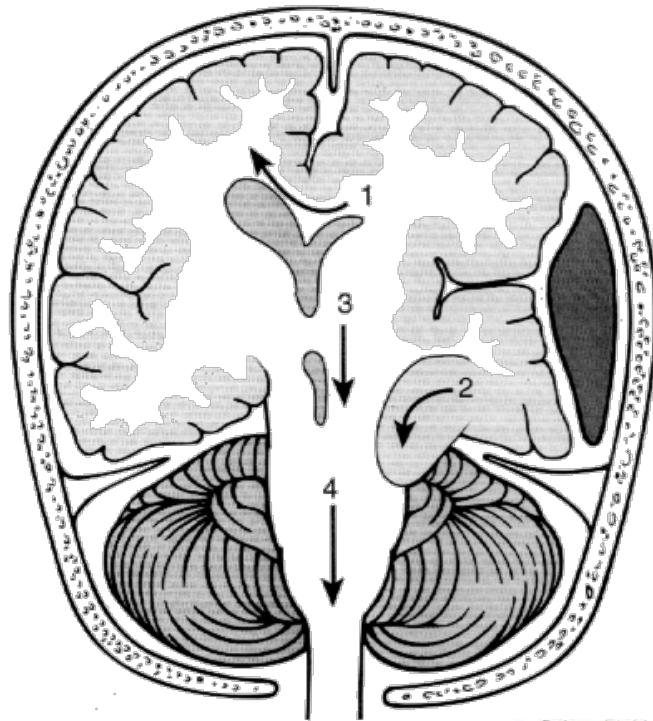
- Fracture
 - Meningeal bleeding, epidural hematoma
- Tearing of bridging veins
 - Subdural hematoma
- Intracerebral bleeding vs diffuse axonal injury
- Herniation and ischemia



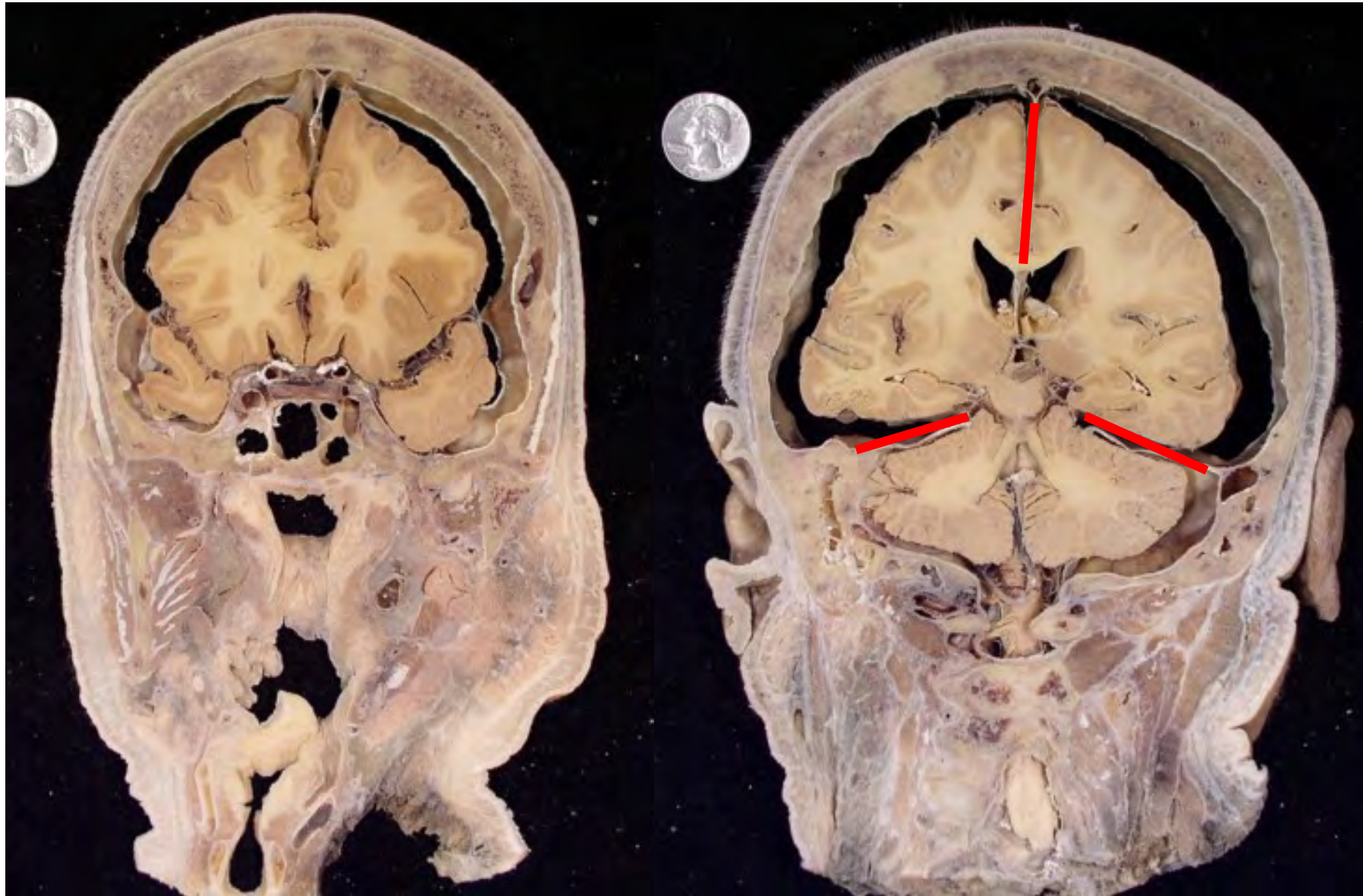
Skull fractures - Calvaria thickness



Herniation



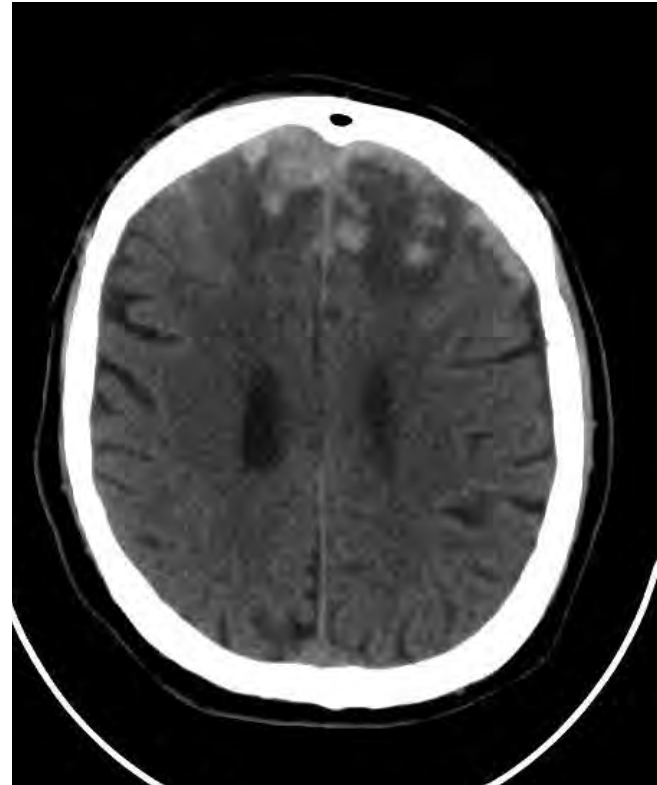
Falx cerebri and tentorium



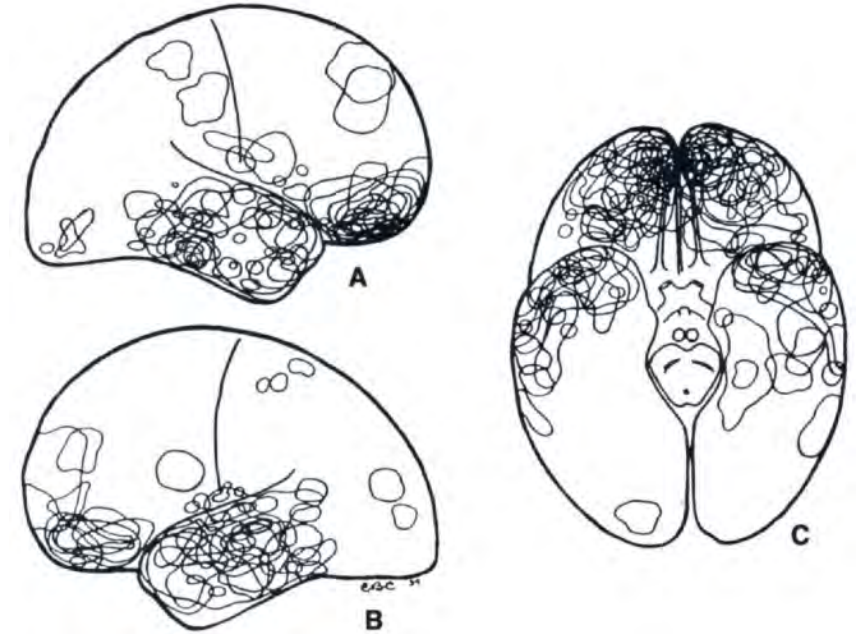
ICH - Kontuusio



Intra Cerebraali Hematooma

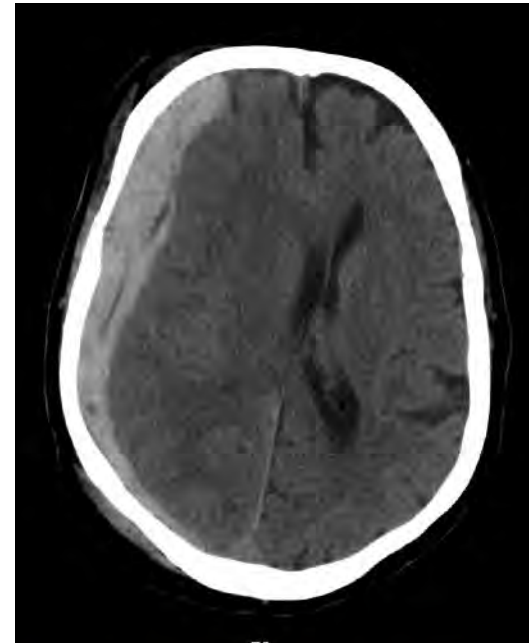
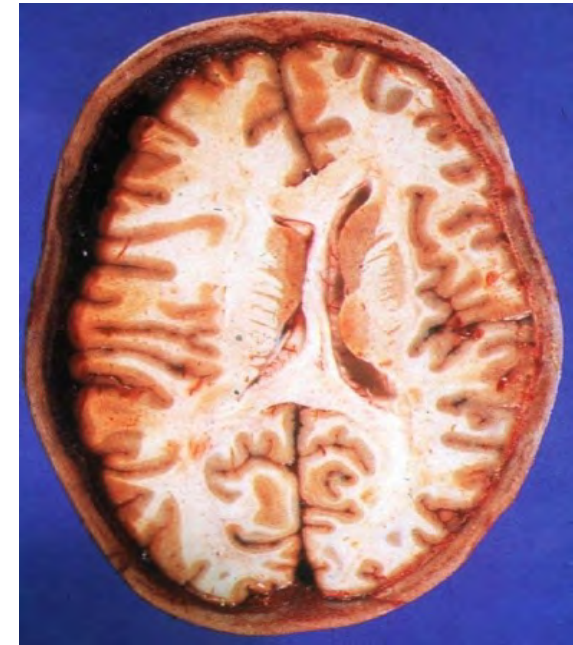
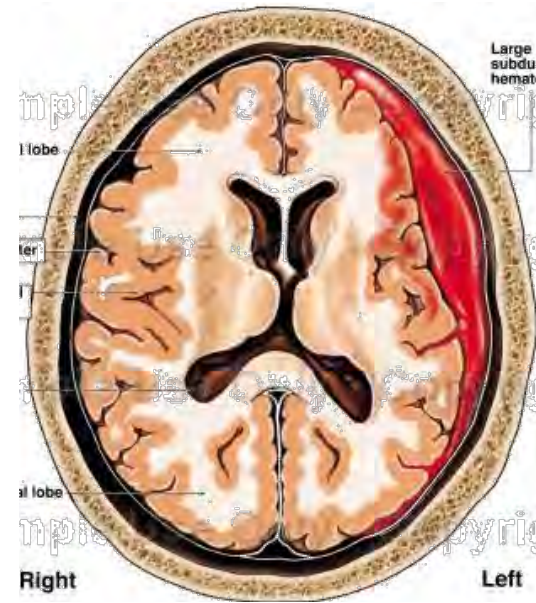


Kontuusiohemoragia



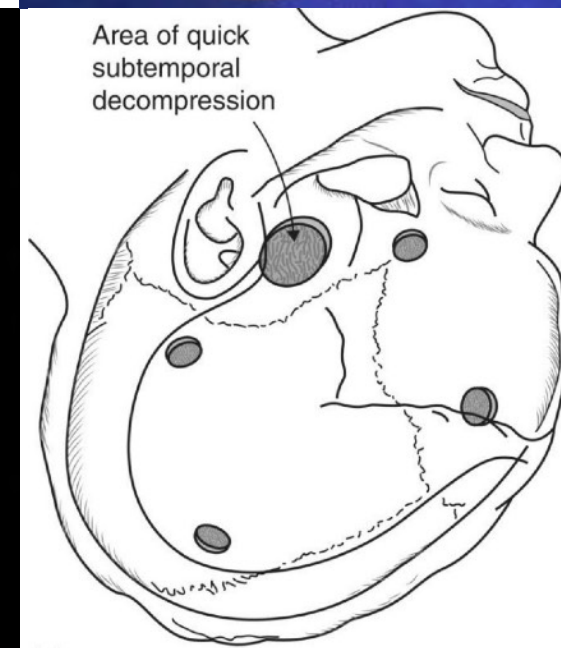
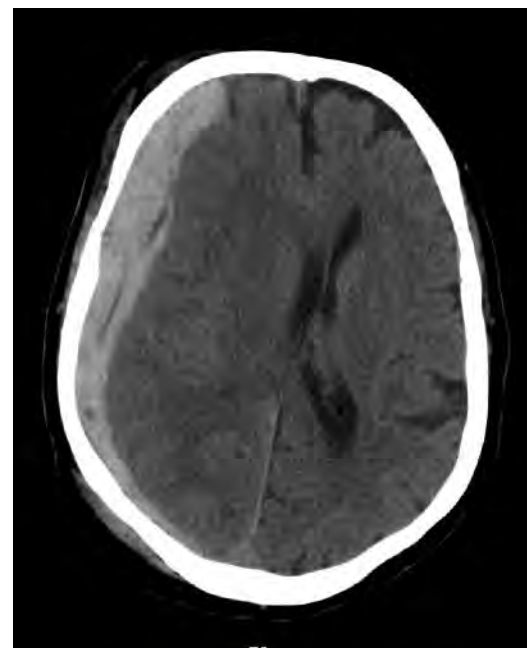
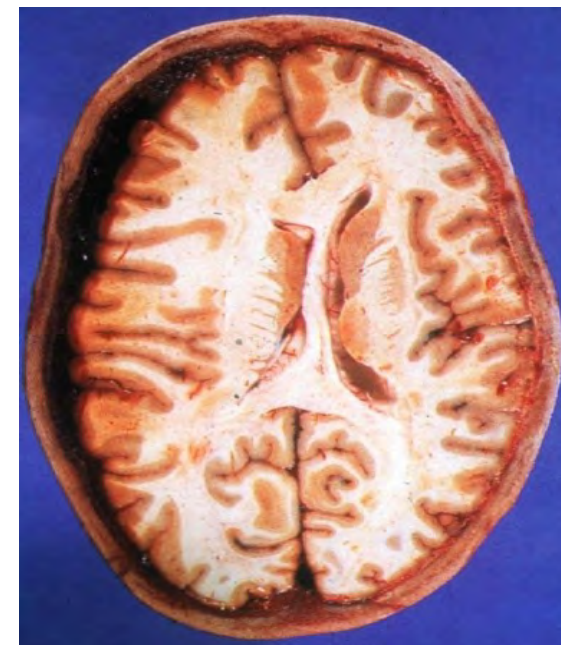
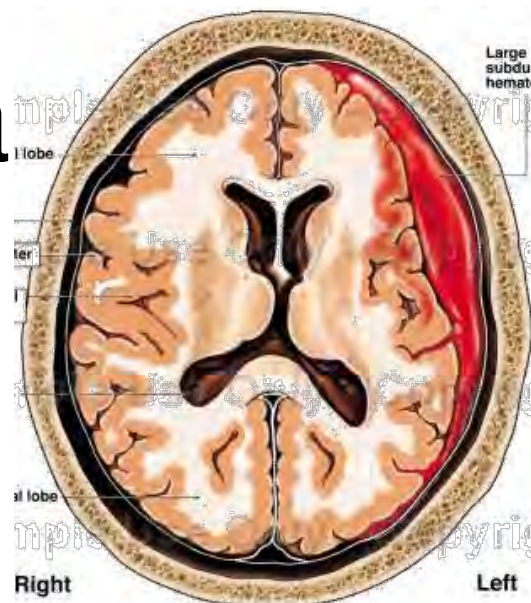
Subdural hematoma

- Acute SDH
 - Trauma
 - Craniotomy and evacuation



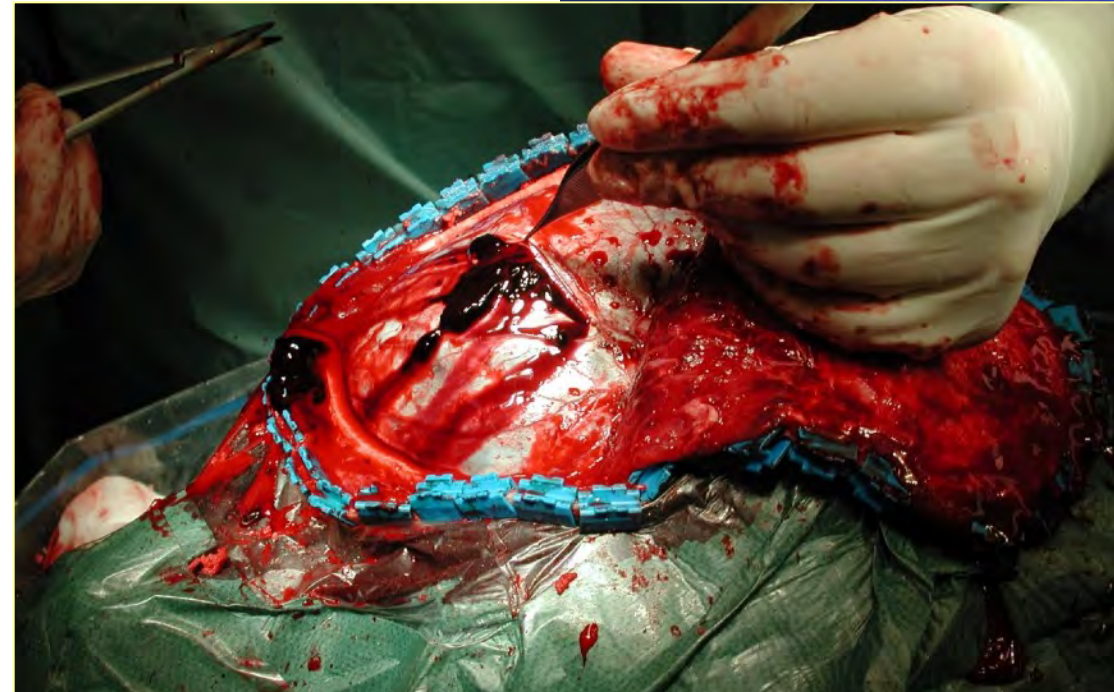
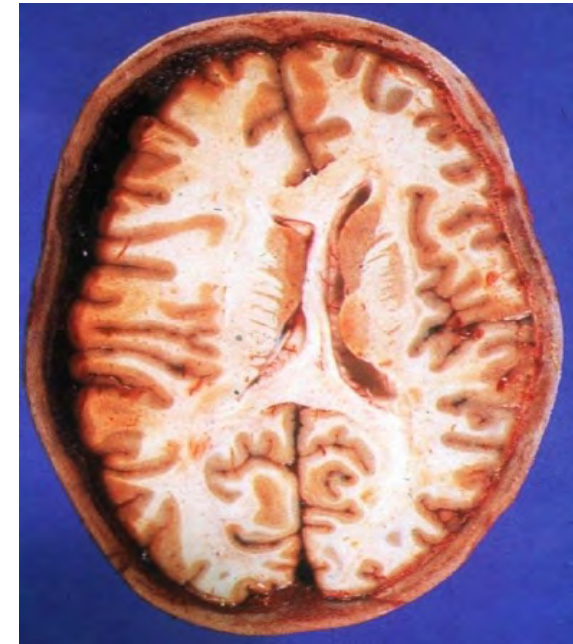
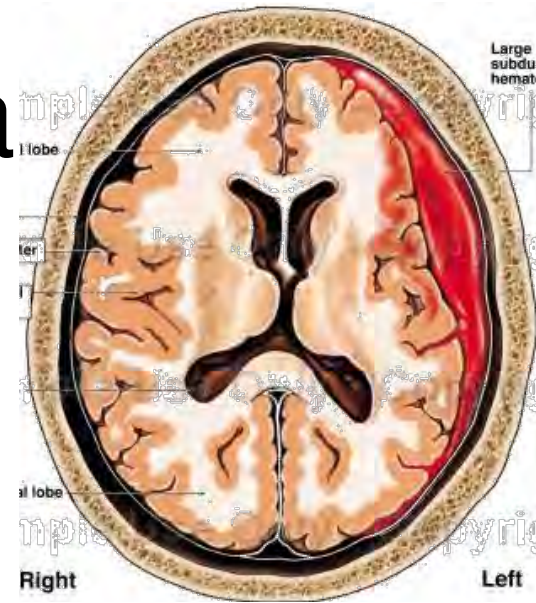
Subduraali hematooma

- Akuutti subduraali
 - Trauma, esim kaatuminen
 - Tavallisin akuutisti leikattava vuoto
 - Kraniotomia ja evakuaatio



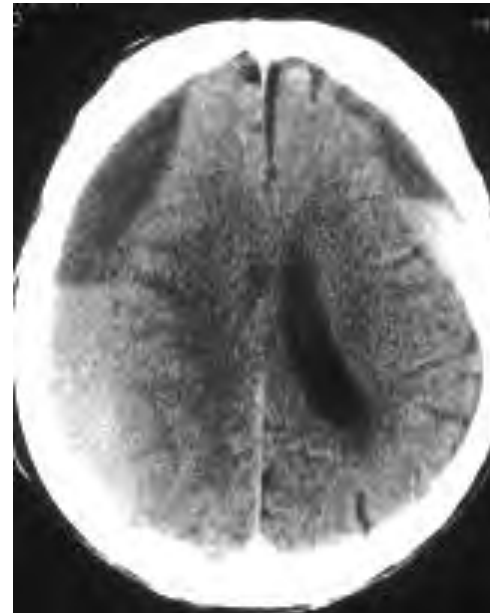
Subduraali hematooma

- Akuutti subduraali
 - Trauma, esim kaatuminen
 - Tavallisin akuutisti leikattava vuoto
 - Kraniotomia ja evakuaatio



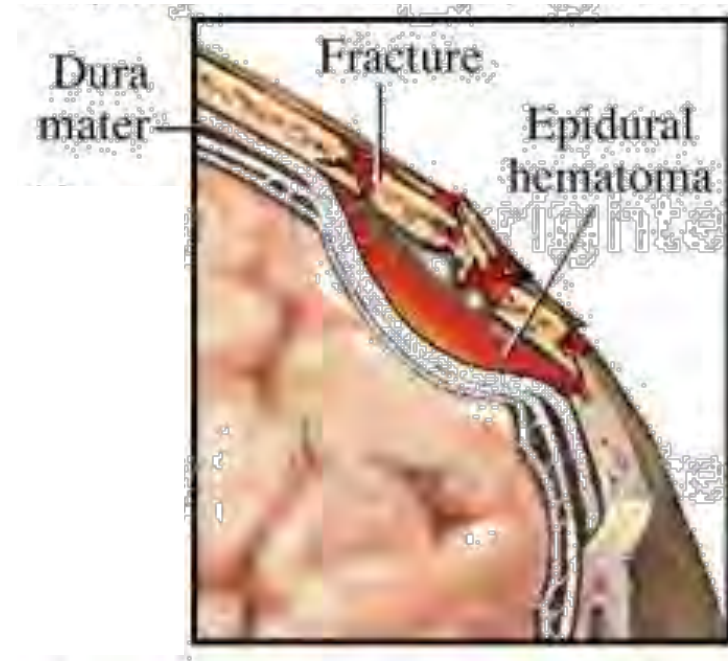
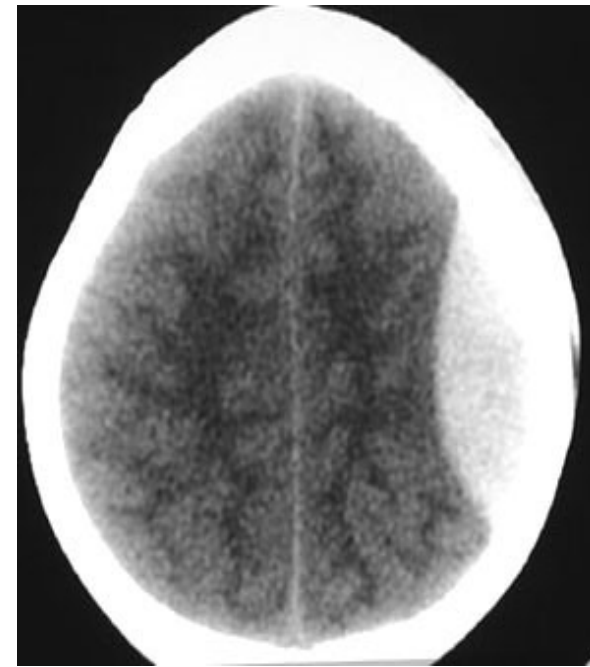
Subdural hematoma

- Akuutti subduraali
 - Trauma, esim kaatuminen
 - Tavallisin akuutisti leikattava vuoto
 - Kraniotomia ja evakuaatio
- Chronic SDH
 - Elderly person, mild injury
 - Anticoagulant therapy
 - Slow onset of symptoms
 - Trephination
 - Recurrence

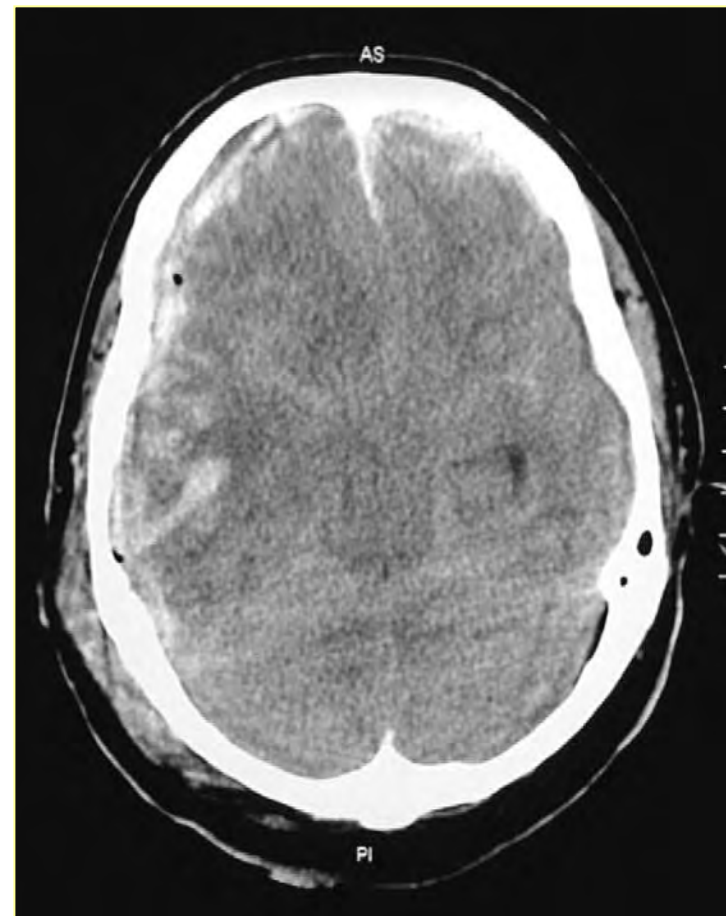
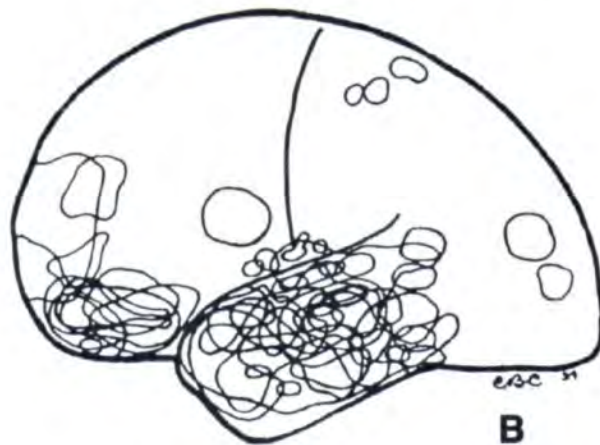


Epidural hematoma

- Skull fracture
- Young patient
- Arterial bleeding

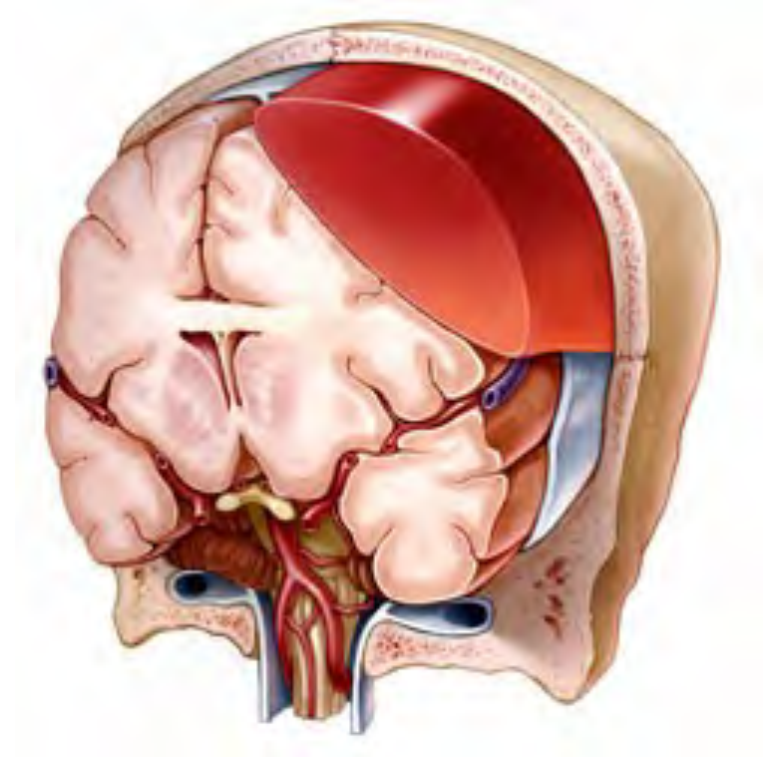


Brain contusion



ICPn treatment

- Avoid Secondary injury
- Neuroanesthesia
- intubation ja ventilation
 - head elevation
 - hypertonic saline
 - mannitoli
 - preventing seizures

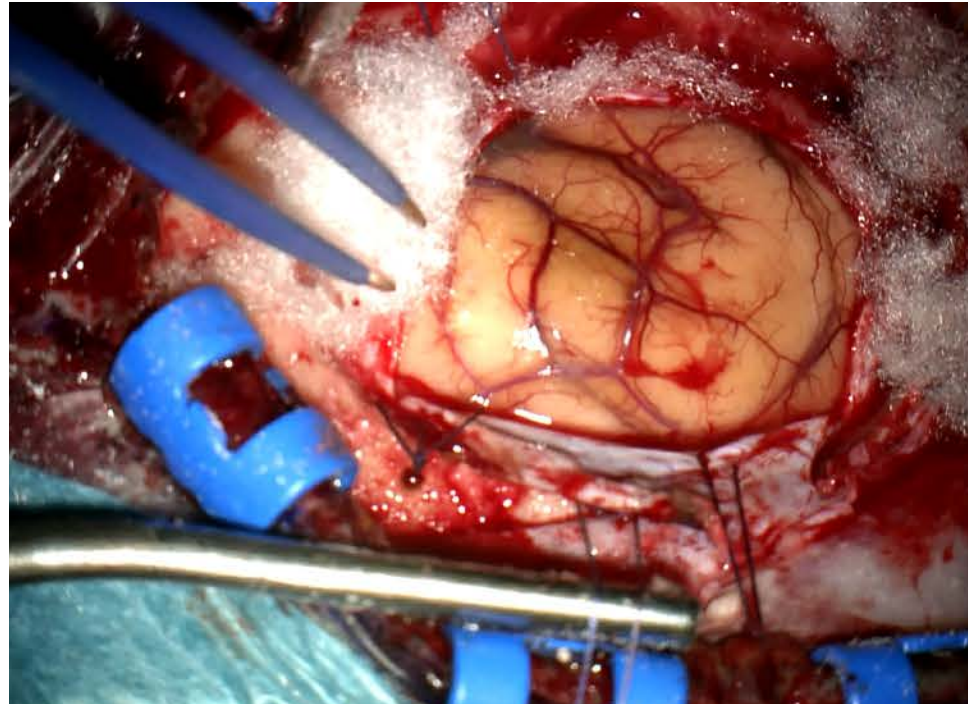


AKUUTTIVAIHEEN HOITO



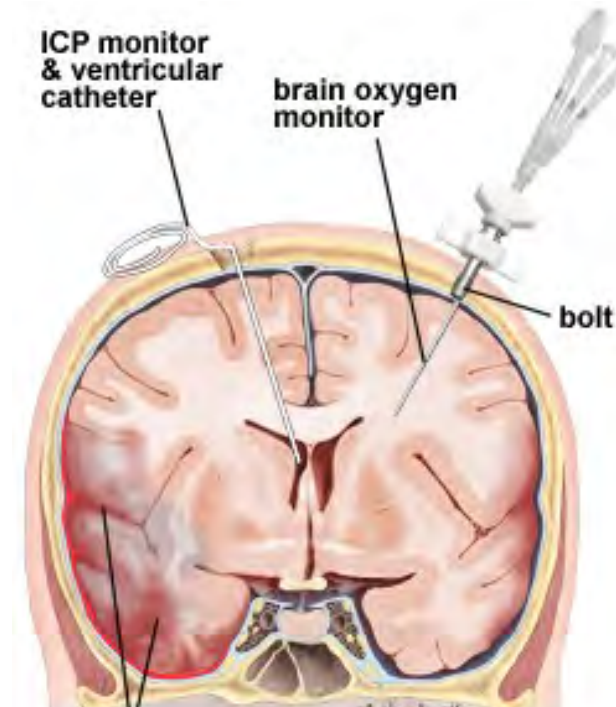
Kohonneen ICPn hoito

- Sekundaarivaurion estoa
- Neurotehoahoito
- Ekspansiivisen hematooman poisto kraniotomiateitse



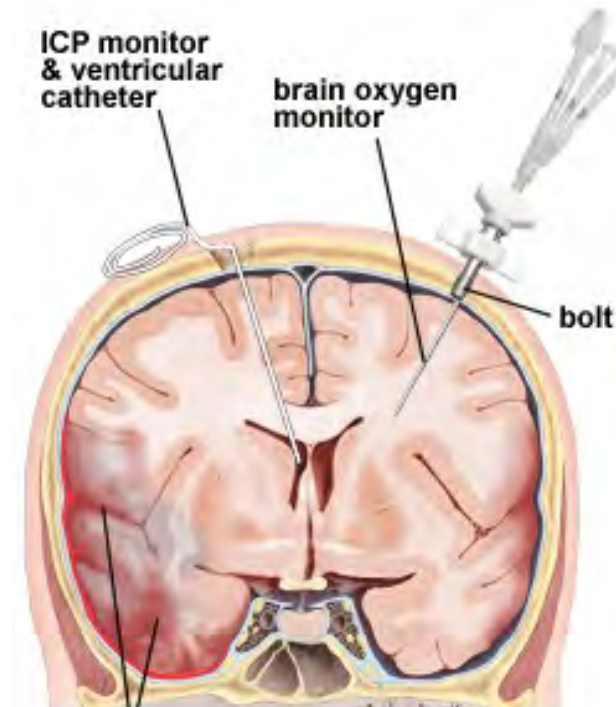
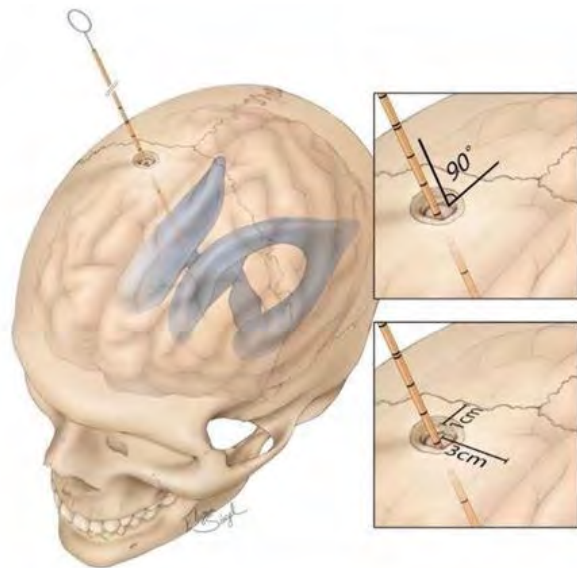
Kohonneen ICPn hoito

- Sekundaarivaurion estoa / ICPn hoitoa
- Neurotehohoito
- Ekspansiivisen hematoonan poisto kraniotomiateitse
- Aivopainemittari



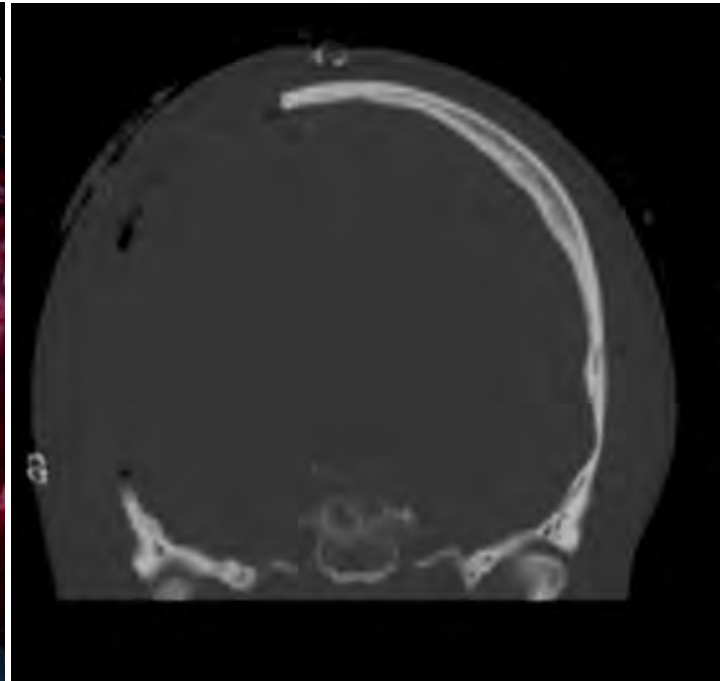
Kohonneen ICPn hoito

- Sekundaarivaurion estoa / ICPn hoitoa
- Neurotehohoito
- Ekspansiivisen hematoonan poisto kraniotomiateitse
- Aivopainemittari
- Ventrikulostomia



Kohonneen ICPn hoito

- Sekundaarivaurion estoa / ICPn hoitoa
- Neurotehohoito
- Ekspansiivisen hematooman poisto
- Aivopainemittari
- Ventrikulostomia
- Hemikraniectomia



Kohonneen ICPn hoito

- Sekundaarivaurion estoa / ICPn hoitoa
- Neurotehohoito
- Ekspansiivisen hematoonan poisto
- Aivopainemittari
- Ventrikulostomia
- Hemikraniectomia

