

# Subdural Hygroma (s. Subdural Effusion)

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**SUBDURAL HYGROMA** - excessive CSF collection in subdural space. [Greek *hygros* – wet]

## ETIOLOGY, PATHOPHYSIOLOGY

- MOST COMMON CAUSE** - **cranial trauma with arachnoid tearing and arachnoid-dura separation** (→ CSF escape into subdural space) - **TRAUMATIC SUBDURAL HYGROMA**.
  - develops in ≈ 10% severe head injuries.
  - skull fractures are found in 39% cases.
  - predisposing factors: **cerebral atrophy** (present in 19% hygromas), vigorous therapeutic dehydration (iatrogenic brain collapse), intracranial hypotension (e.g. in prolonged lumbar drainage), pulmonary hypertension (e.g. in chest trauma, pneumonia).
  - CSF is usually xanthochromic.
  - may accumulate immediately after trauma or in delayed fashion.
  - most likely *locations of arachnoid tears*: sylvian fissure, chiasmatic cistern.
  - **"complex hygroma"** - associated with other intracranial lesions (subdural hematoma, epidural hematoma, intracerebral hemorrhage, etc).
- Infection** of meninges or skull (most commonly – **influenzal meningitis** or **mastoiditis**).
- Rupture of arachnoid at basal cistern in **communicating hydrocephalus**.
- Complication of ventricular shunting**; in patients with shunts (esp. if overdrainage occurs), disruption\* of arachnoid can lead to hygroma.
  - \*spontaneous or elicited by minor head trauma or previous arachnoid injury (e.g. ventricular tap, intracranial pressure sensor).
  - best prevention is use of shunt alternative (third ventriculostomy) or overdrainage-limiting device.
  - increasing valve opening pressure or using flow-rate-limiting system can be successful treatment.
- Complication** of arachnoid cyst marsupialization or resection.
- Rare complication of **spinal anesthesia**.

## FURTHER COURSE

- Spontaneous RESOLUTION** of subdural collection along with cerebral expansion.
- Hygroma PROGRESSION**: **transudation / further CSF accumulation** (flap-valve mechanism) → increasing brain dislocation → rupture of bridging veins\* → **bleeding** into newly formed subdural space (well documented **transformation to subdural hematoma**) → **neomembrane (capsule)** formation (chronic subdural hematoma).
  - \* stretch of draining veins by hygroma can cause multiple venous infarcts

## CLINICAL FEATURES

- Asymptomatic**
- May increase in size (due to flap-valve mechanism, bleeding) → **mass effect** with significant **morbidity** similar (in character and evolution) to subdural hematoma:
  - ICP↑** (headaches, nausea, decreased level of consciousness)
  - Focal signs**

## COMPLICATIONS

- Brain **herniation**
- Transformation into **subdural empyema**

## DIAGNOSIS

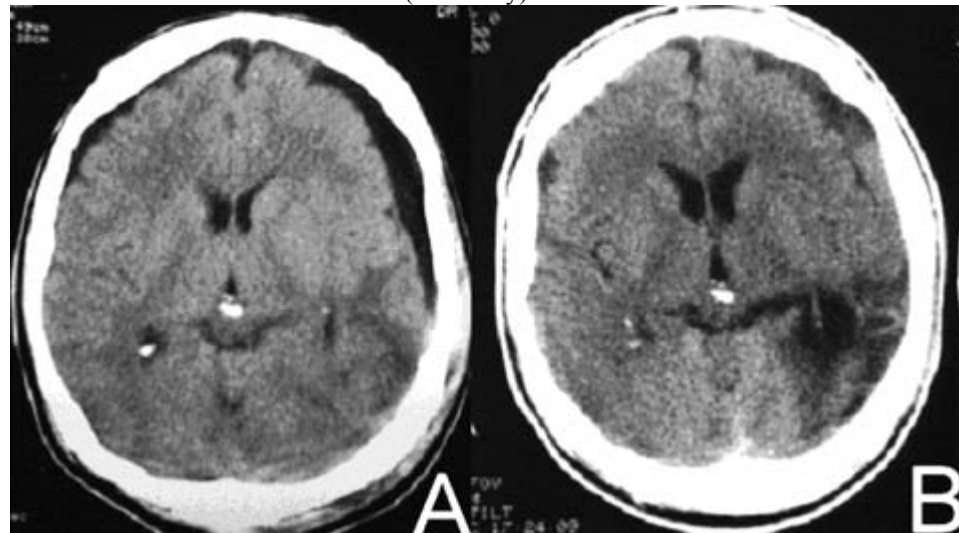
**Neuroimaging** - **crescent-shaped extraaxial collection with CSF density** (hard to separate from chronic subdural hematoma!!!; H: MRI); commonly bilateral.

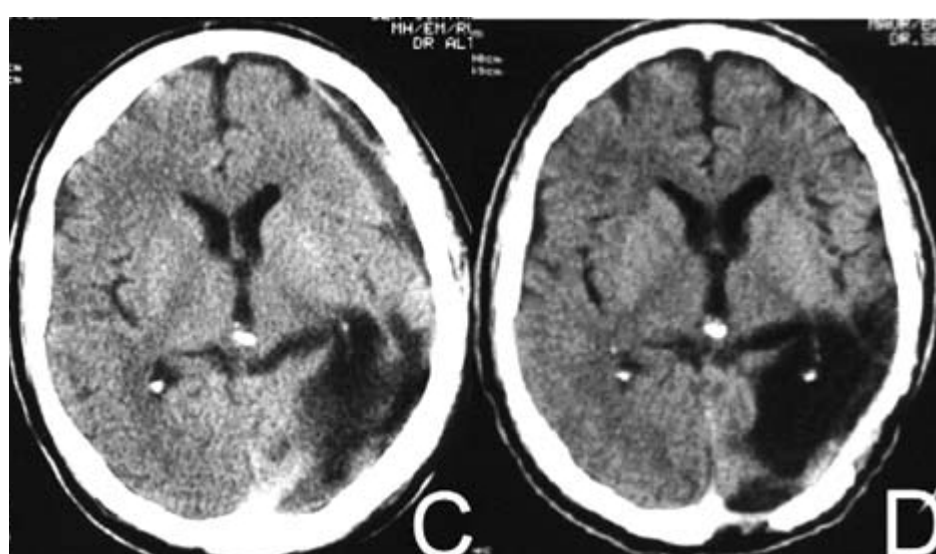
- differentiation from BRAIN ATROPHY**:
  - in **hygroma** gyri are significantly displaced away from calvaria, occasional slight mass effect, no widening of cortical sulci (sulci even may be obliterated due to mass effect).
  - in **cerebral atrophy**, appearance of bilateral frontal “subdural hygromas” may be seen when patient is supine; similar finding can be seen in **young children** (benign enlargement of subarachnoid space - should resolve in first 2 years of life).
  - **"cortical vein sign"** on gadolinium MRI - cortical veins and their branches are seen traversing widened CSF spaces over cerebral convexities - evidence of **cerebral atrophy** (rules out diagnosis of subdural hygroma\*).
    - \*hygroma displaces cortex and cortical veins → cortical veins seen only at margin of displaced cortex, and do not traverse fluid collections over cerebral convexities.

**Definitive diagnosis** - only by **trephine openings** in skull:

- classically **chronic subdural hematoma** contains dark "motor oil" fluid which does not clot.
- if subdural fluid is **clear**, collection is termed **subdural hygroma**; hygroma fluid (i.e. CSF) contains **prealbumin** (not present in subdural hematoma) and may be under high pressure.

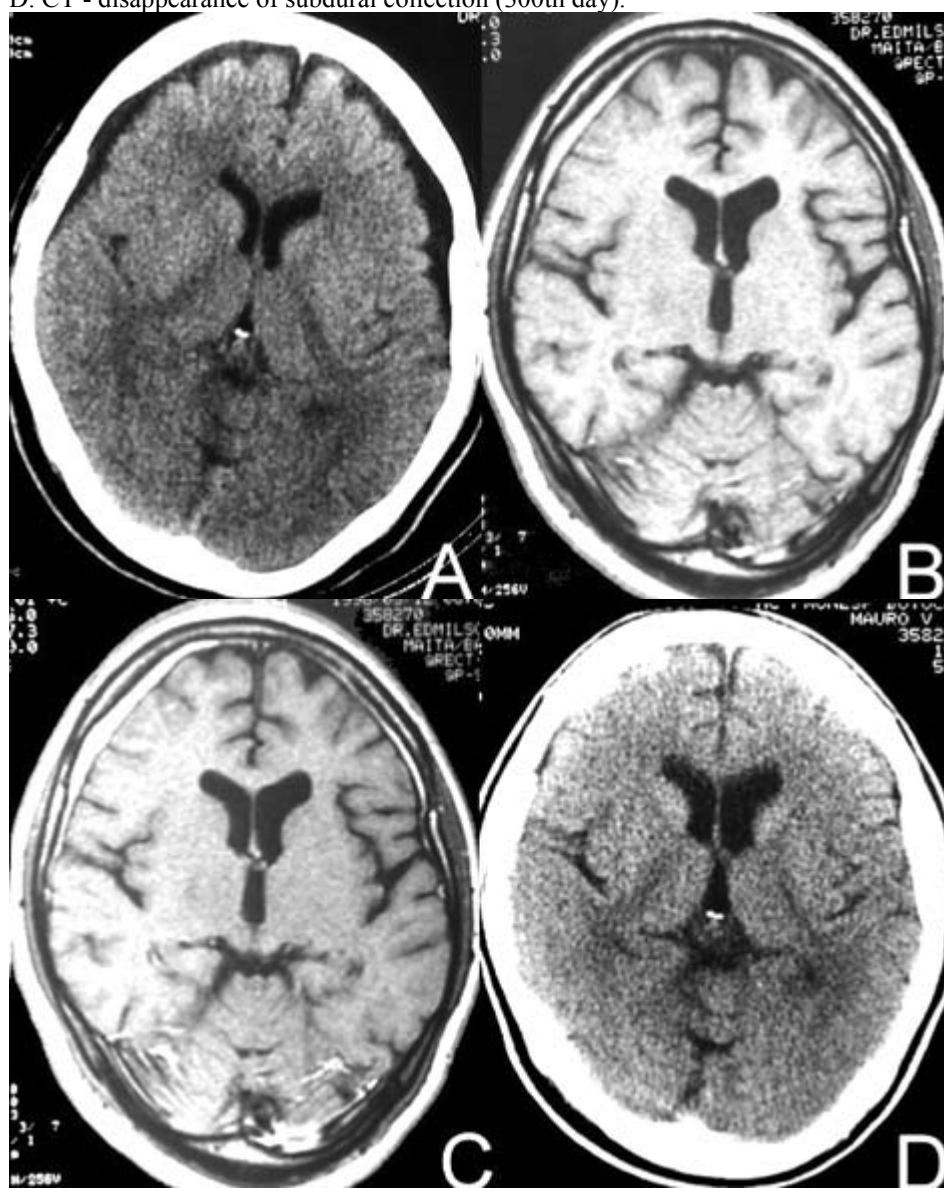
- CT - left frontal subdural hygroma (9th day).
- Enhanced density and heterogeneous appearance (53rd day) – signs of subdural bleeding into hygroma space
- Reduction of hygroma, with probable neomembrane (117th day).
- Resolution of subdural collection (730th day).





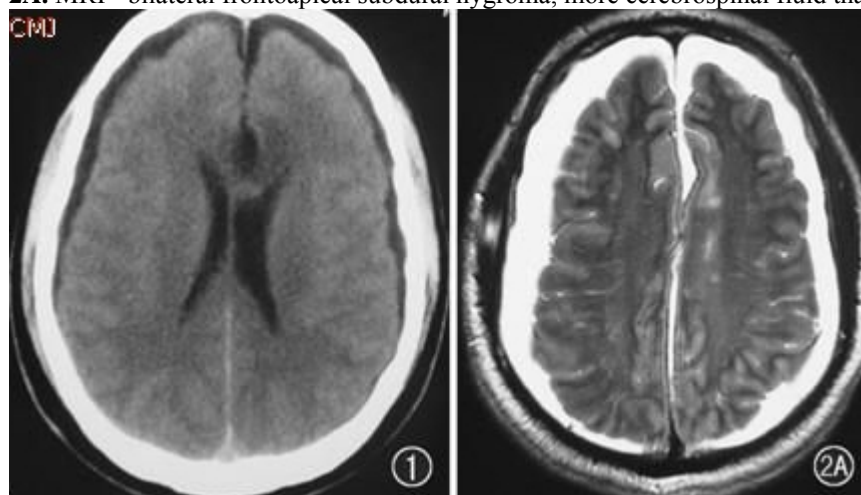
Source of pictures: Marco Antonio Zanini et al. "Traumatic Subdural Hygroma"; Arq Neuropsiquiatr 2007;65(1):68-72 >>

- A. CT - bilateral frontal subdural hygroma (12th day).
- B. T1-MRI (no contrast) - laminar subdural hematoma, without compression on underlying brain (191st day).
- C. T1-MRI (with contrast) - peripheral enhancement (191st day).
- D. CT - disappearance of subdural collection (300th day).

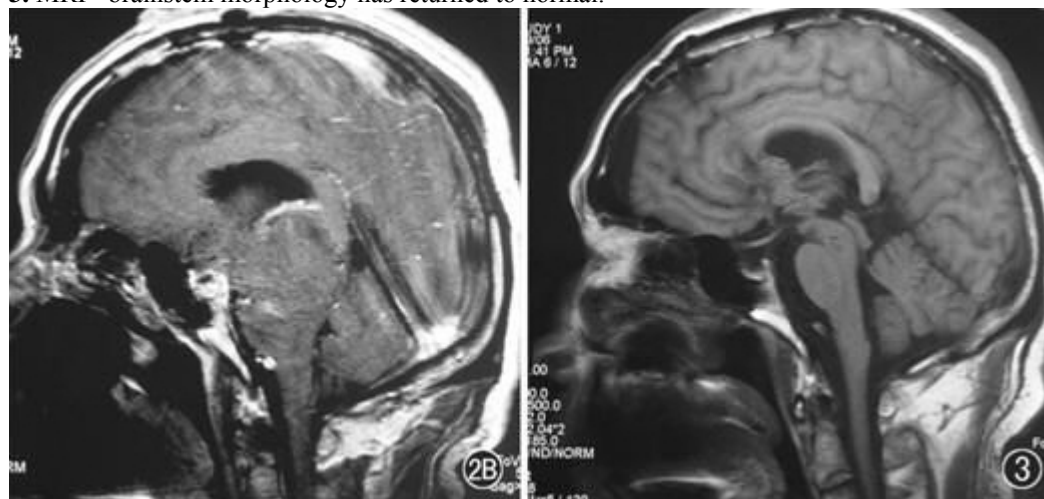


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- 1. CT - bilateral frontoapical subdural hygroma.
- 2A. MRI - bilateral frontoapical subdural hygroma, more cerebrospinal fluid than CT.

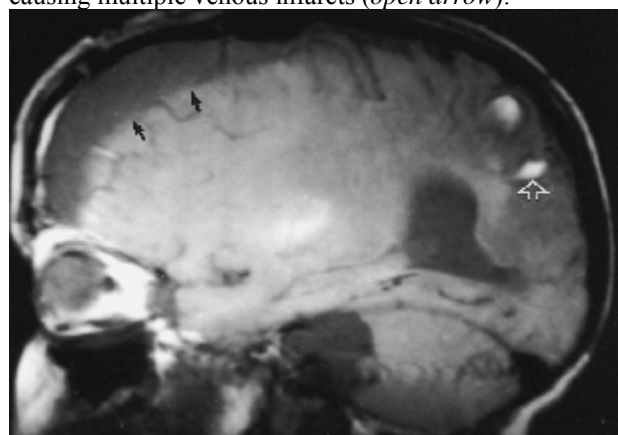


- 2B. MRI - compressive brainstem deformation.
- 3. MRI - brainstem morphology has returned to normal.



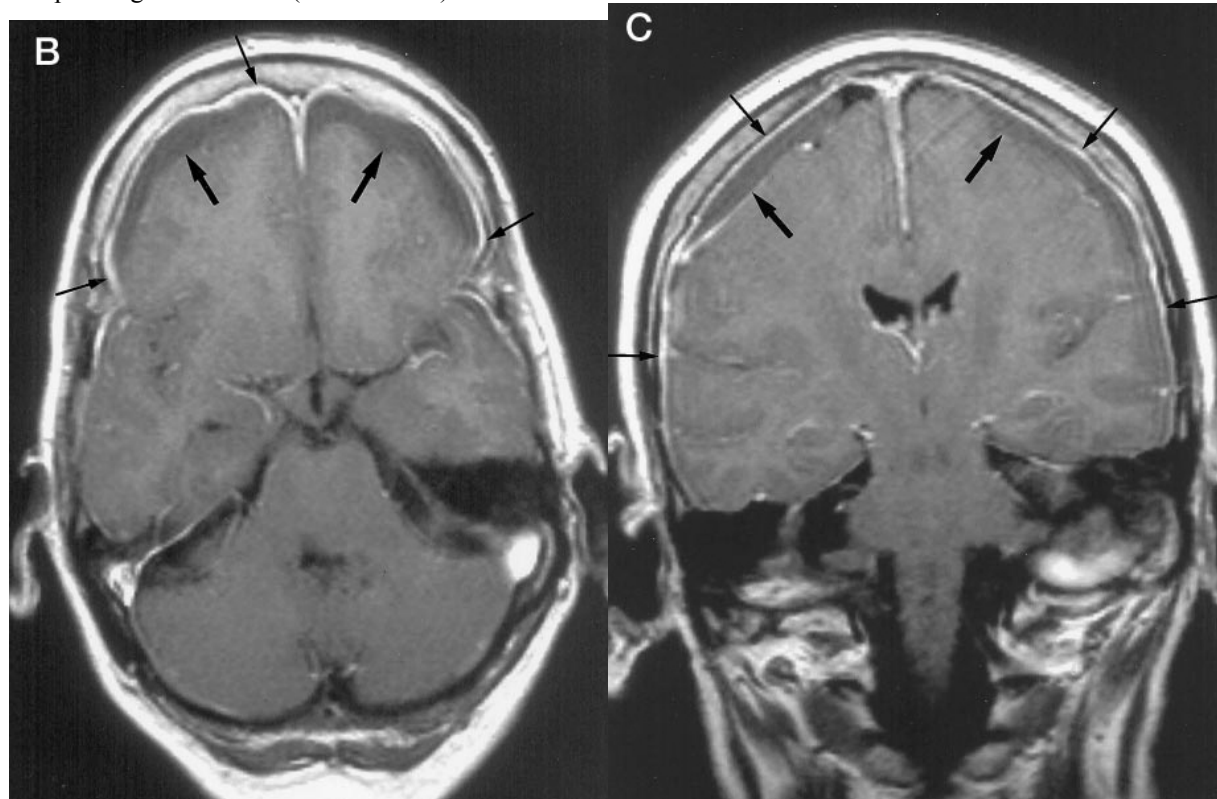
Source of pictures: Wang Ji-sheng, Ji Nan "Compressive brainstem deformation resulting from subdural hygroma after neurosurgery: a case report" >>

Postoperative MRI - child with large cystic craniopharyngioma and hydrocephalus; sudden tumor removal and hydrocephalus decompression resulted in subdural hygroma formation (*small arrows*); hygroma stretched draining veins, causing multiple venous infarcts (*open arrow*):



Source of picture: Julian R. Youmans "Youmans Neurological Surgery", 4<sup>th</sup> ed. (1997); figure 126-7; Publisher: W.B. Saunders Company; ISBN-10: 0721668453; ISBN-13: 978-0721668451 >>

Gadolinium T1-MRI - diffuse, high enhancement of pachymeninges (*small black arrows*) together with bifrontal hygromas compressing frontal lobes (*black arrows*):



Source of pictures: J. S. P. van den Berg et al. "Subdural Hygroma: A Rare Complication of Spinal Anesthesia" >>

Small, low-density, extra axial collection over right frontal lobe; slight mass effect; adjacent sulci are compressed:



Benign enlargement of subarachnoid space in child (CT) – no mass effect; normally resolves within first 2 years of life:



Source of picture: Andrew L Wagner, MD, Subdural Hematoma: Multimedia >>

## TREATMENT

**Asymptomatic** → **observation** (usually resolve spontaneously within several months).

N.B. observation leaves risk of transformation into subdural hematoma (which already requires **craniotomy**).

**Symptomatic** (esp. deteriorating clinical status accompanied by hygroma volume↑ with brain compression → herniation) → **surgery: external burr-hole drainage**;

- maintain subdural drain for 24-48 hrs post-op; if satisfactory resorption does not occur → shunting of subdural space.
- **recurrence** following simple burr-hole drainage is common; for recurrent cases:
  - a) **craniotomy** to locate site of CSF leak (may be very difficult)
  - b) subdural-peritoneal **shunt** may be placed.

**BIBLIOGRAPHY** for ch. "Head Trauma" → follow this [LINK](#) >>