

MENINGEAL IRRITATION SYNDROME



CNS is wrapped in three membranes from the outside in: *dura mater, arachnoid and piamater*. Between the arachnoid and piamater there is a space that surrounds the brain and the marrow and communicates with the ventricles: **the subarachnoid space**, where the cerebrospinal fluid (CSF) is.

- CSF is produced by the choroid plexus and is absorbed in the arachnoid villi.
- In an adult the amount of CSF is about 100-150ml.
- If CSF is produced in excess, it cause **increased intracranial pressure** and **signs of neuroradiculitis** and painful contractions of the paravertebral muscles called meningeal irritation signs.


Intracranial hypertension

causes the following symptoms:


- 1) The **cephalgia** in intracranial hypertension is particularly intense, perceived as „a helmet" sometimes more intense in the occipital area.
- ◆ It does not succumb to the usual analgesics (aspirin, algocalmin, antineuralgic etc).
- ◆ It intensifies after efforts that increase abdominal pressure (cough effort, defecation), the compression of the jugular and head movements.
- ◆ It attenuates when applying an ice bag on the head or after the decreasing of the intracranial pressure by: CSF evacuation by lumbar puncture, depletion, vomiting.

2) **Photophobia** or intolerance to light makes the patient sit with their eyes closed or staring at the darkest area of the room.

3) **Vomiting**, "central" type – in the morning, projective, which are not preceded by nausea. They relieve the headache.

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4) In new borns and infants **bulging fontanelle** may occur, but this is often absent due to dehydration(exicosis) that occurs as a result of vomiting and sweating. Also in this age group and in young children a characteristic scream may occur (encephalitic cry).

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Signs of radiculopathy

are the following:

- ◆ **Rachialgia** or perceived pain along the spine. They can be intense and can intensify especially in flexion of the spine and may be accompanied by very strong cutaneous hyperesthesia (the patient can not bear any type of covering).
- ◆ **Meningeal irritation signs:**

1) The particular position, the **cock rifle** position is characteristic for the meningeal irritation syndrome. The patient lies on the side, with the gaze directed toward the darker part of the room, the head in hyperextension with the thighs flexed on the abdomen and shins flexed on the thighs; this position can be resembled to a cock rifle (flinta). This position is a passive component of the contracture syndrome, since there is no maneuver required from the examiner to highlight it.

2) Neck stiffness is tested with the patient in a supine position. The flexion of the head on the chest is tempted, the hand of the examiner being placed under the nuchal region of the head. Normally this maneuver can be performed easily, but in the case of meningeal irritation the maneuver meets resistance or the flexion may not be possible.

3) The Brudzinski neck sign is tested like neck stiffness, but a little more vigorously. It is positive when the maneuver leads to knee flexion.

4) Nuchal-mydriatic sign is tested like neck stiffness, looking for the appearance of mydriasis.

5) Kernig sign of the torso with the patient in a supine position we try flexing the trunk on the axis of the lower limbs, the examiner's hand being placed under the patient's shoulders. It is positive if the knees are flexed.


6) The tripod sign - if a patient with meningeal irritation syndrome is asked to sit up he will support himself by placing his hands behind him to maintain his upright position, making a tripod.

7) The "kissing sign" - the patient can not touch his knees with his lips, in the upright position. It is a useful sign especially in children.

8) Kernig sign of the lower limbs, with the patient in a supine position we try to lift his legs in hyperextension. In patients with meningeal irritation syndrome this maneuver leads to the flexion of the knees and pain in the posterior region of the thighs and calves.

9) Contralateral Brudzinski sign is tested with the patient in a supine position in the following way: the examiner flexes one of the legs from thigh and knee, then extends the leg suddenly on the thigh. The sign is positive if the flexion of the opposite knee (contralateral) occurs and/or a violent pain in the gastrocnemius muscles and posterior thigh muscles is felt.

10) Lassage sign is being tested in infants and toddlers as follows: the child is suspended from the armpits. If there are signs of meningeal irritation syndrome, he flexes his thighs on his hips and his shins on his thighs. When extension is attempted and after it is done, the limbs go back to the initial position just like a **resort**.

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If the clinical examination is suggestive for meningeal irritation syndrome it is advised to continue with laboratory explorations to find a specify etiology. If we have access to imaging equipment - CT, MRI- there, it is useful to begin with such a metod. If these type of explorations are not possible, an eye exam is recommended to exclude papillary edema, a complete neurological examination can exclude a focal lesion, then we proceed with an urgent lumbar puncture.

Lumbar puncture technique - Incidents and accidents.

Patient positioning is extremely important to perform this maneuver in the best possible conditions. It uses two positions:

- seated with the back to the bed, knees gathered at the chest and head flexed.
- lateral decubitus position with knees gathered at the chest and head flexed, placing a pillow between knees to prevent disturbances of the bones

The landmarks used are the iliac crests and the line that connects them. This is usually located at the L3-L4 intervertebral space. Then spotting the spinous processes the middle of the L3-L4 or L4-L5 space is determined and the place where the puncture needle will be inserted is picked. A special spinal mandrel needle is used, preferably a disposable one, size 20 or 22G. After sterilising the skin rigorously the needle is inserted perpendicularly in the middle of the L3-L4 or L4-L5 interspace, after crossing the skin the needle is oriented at an angle of 10-20 degrees cranial advancing the needle very slowly. Crossing the interspinous ligament is associated with an increased resistance, just like crossing the yellow ligament, after which feels a void sensation is felt, like the one offered by entering a vein, a sign that the subarachnoid space was reached. The mandrel of the needle is removed and cerebrospinal fluid starts to drip.


Incidents and accidents:

- White puncture- due to poor technique or because of local conditions (spinal consolidated fracture, ligament ossification) the subarachnoid space can not penetrate. In these cases it is useful, if the puncture is considered absolutely necessary for the diagnosis, to try it in another space or suboccipital.
- The puncture accident is due to an accidental vascular lesions and we get a hemorrhagic CSF. In these cases liquid can be collected in more test tubes, to see if it clears out or another puncture can be attempted in a space above. If case of traumatic puncture it is useful to estimate the WBC/RBC ratio, which normally is 1/1000.

Cerebrospinal fluid is collected in at least three test tubes: one non-sterile for the biochemical and cytological exam and two sterile test tubes for microbial exams – one tube for the common microbial flora and one for mycobacteria. If a fungal etiology is suspected is useful to collect in an additional tube for that type of exams. The amount of CSF collected should be approximately 2 ml in each tube.

In *subarachnoid hemorrhage* the hemorrhagic aspect of the liquid is maintained evenly throughout the puncture, it does not coagulate if it is left in the test tube. Over time, the red blood cells settle and the supernatant is clear or xanthochrom (yellow) depending on the length of bleeding. By shaking the tube the red blood cells are released from the sediment and the liquid takes on a hemorrhagic aspect again.

Post lumbar puncture syndrome usually occurs in the first 24 hours after the exam and is manifested by intense headaches accompanied by nausea or vomiting and vertigo, especially during standing and walking. Back pains, pain in the legs, more or less intense can occur. The only treatment is analgesics or cofedol and resting. However, the symptoms may persist for up to 10-14 days.

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Normal CSF is normotensive (in lumbar puncture CSF flows constantly drop by drop) has the following constants:

- **appearance:** clear, like "spring water"
- **cellularity:** few lymphocytes (2-5/mm³)
- **proteinorachy:** 0.20-0.30 g/l, expressed quality value by **Pandy negative reaction**
- **glycorachy:** 1/2-2/3 of the glucose value; 60-80mg%
- **chlorurorachy:** 720-750 mg%

MENINGISM, MENINGEAL REACTION AND MENINGITIS

- ◆ 1) meningeal irritation syndrome with clinical manifestations and normal cerebrospinal fluid. This association is called **meningism** and can occur in certain microbial and viral infectious diseases, more or less severe, and in case of stroke.
- ◆ 2) meningeal irritation syndrome with clinical manifestations in association with a minimum modified LCR, which can not be diagnosed as meningitis (clear, normal CSF, Pandy reaction +/- or + slightly elevated proteinorachy 10 to 15 cells/mmc, all lymphocytes). Some authors deny the existence of this entity, named **meningeal reaction**, arguing that it is very difficult to determine where the meningeal reaction ends and meningitis begins.
- ◆ 3) meningeal irritation syndrome with clinical manifestations and modified LCR, allowing the diagnosis of different types of **meningitis**.

Macroscopic CSF can be:

- in terms of pressure: normotensive, hypertensive, hypotensive
 - in terms of the appearance: clear, opalescent, cloudy, hemorrhagic, xanthochrom.
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The type of meningitis	CSF appearance	Pandy R.	cellularity	glycorachy	proteinorachy	chlorurorachy
Viral meningitis (serous, aseptic with clear fluid)	clear or slightly opalescent	+/- +	Hundreds->1-2 thousand polymorphic lymphocytes on mmc	normal	Slightly high 0,5-1g/L	normal
Bacterial meningitis with cloudy fluid	Cloudy, purulent, "cabbage juice" aspect	++/ +++	Thousands->tens of thousands PMN on mmc	very low	high 1-2g/L	normal
TB meningitis - with clear liquid, slightly opalescent or xanthochrom	clear, slightly opalescent, xanthochrom or hemorrhagic	++++	Hundreds of lymphocytes monomorphic on mmc	very low	very high 1-5g/L	low
Meningitis decapitated by antibiotics	opalescent or clear	+/-	Hundreds (%PMN)	low	Normal/ high	normal

If LCR's examination and clinical manifestations suggest a mycobacterial etiology (tuberculosis) a fluid sample is kept at room temperature for 24 hours and it is observed if a fine fibrin network appears in the CSF, called a veil. If this occurs the mycobacteria can be highlighted faster from it, either directly (colored smear Ziehl-Nielsen) or Lowenstein-Jensen culture medium (4-6 weeks)

Currently it is being attempted to use modern techniques such as highlighting tuberculosis antigen in CSF and polymerase chain reaction for a faster determination of the etiology of tuberculosis.

If the harvested CSF is purulent and/or if the cellularity suggest a bacterial etiology additional investigation are done. The CSF is centrifuged and a smear is made from the sediment which is Gram stained. This method, when positive, allows rapid identification of the germ and early initiation of a better targeted antibiotic therapy. Cultures on the usual mediums will accurately identify the germ and DST (drug susceptibility testing) will guide the therapy.

For viral meningitis we have viral identification
PCR techniques available

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