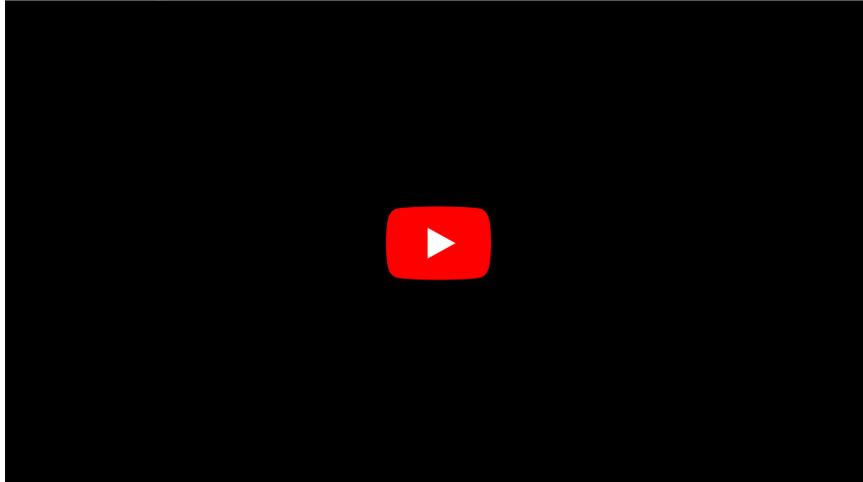
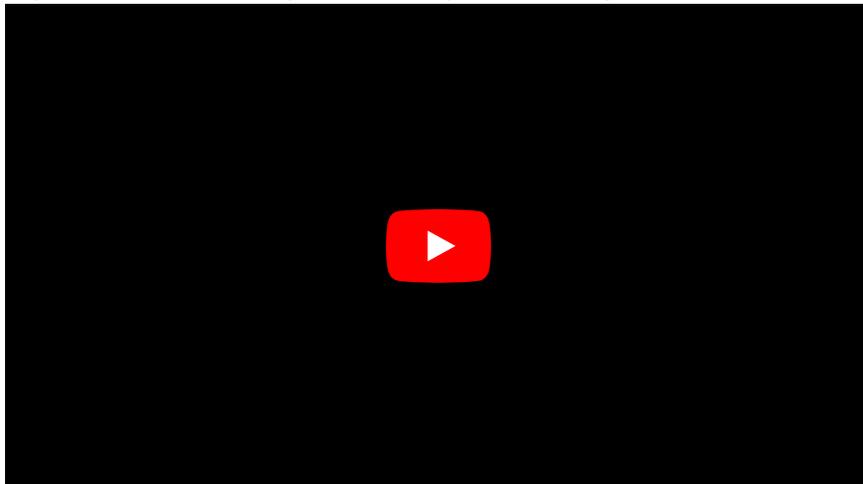


Consciousness and its disorders

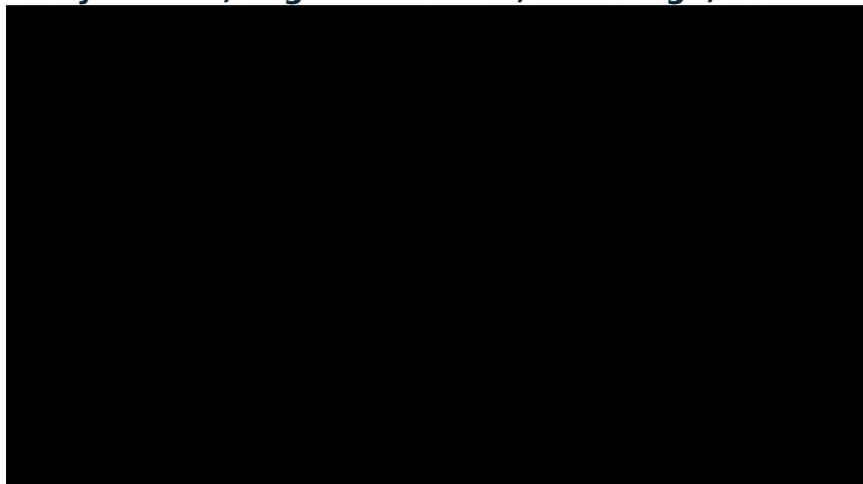
Quantity, somnolence, stupor, coma, brain stem, ARAS, awake:



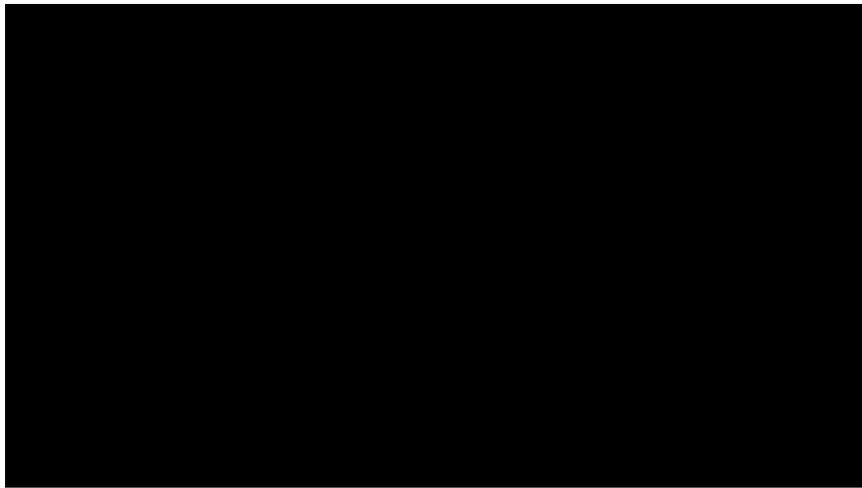
Quality, awareness, hallucinations, illusions, delirium, NPH:



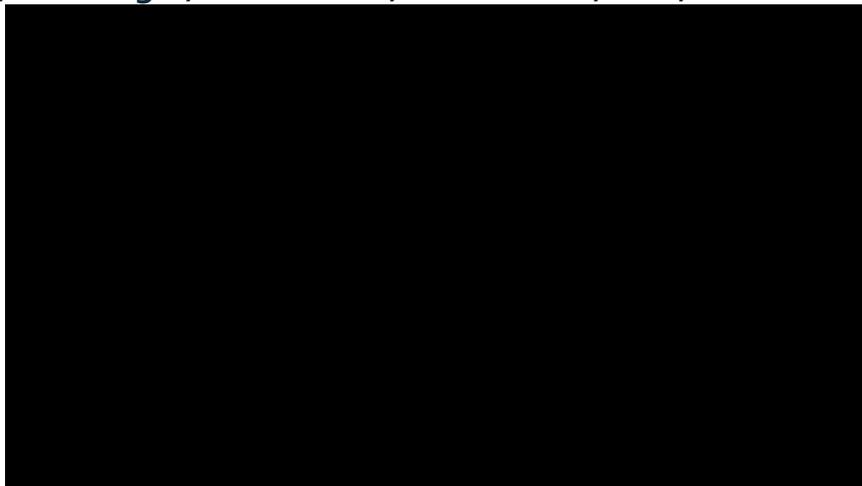
Apallic & locked-out syndrome, vegetative state, coma vigil, DAI:



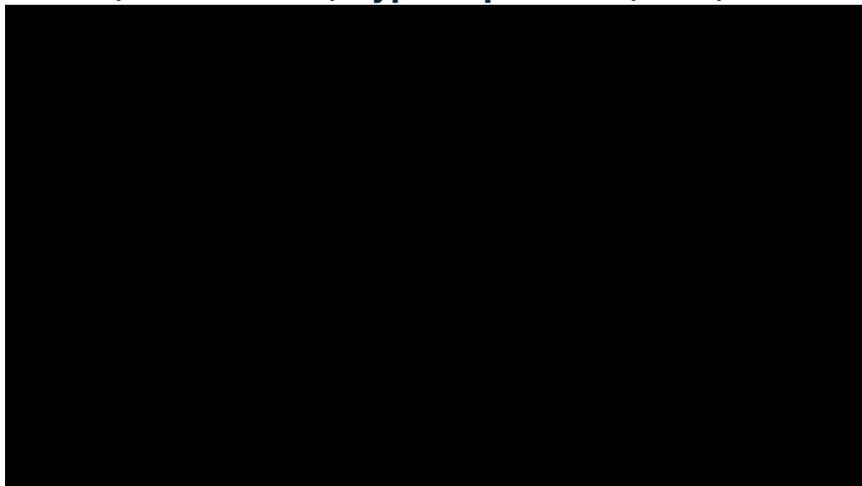
Locked-in syndrome, awareness & vertical eye movement, ALS, ODS:



Syncope: cardiac, vasovagal, micturition, orthostatic, CSS, tLOC:



GCS, brainstem reflexes, brain death, hypercapnia test, CTA, MRA:



The human dimension of consciousness is conditioned by **vigilance (vigilance)**.

Vigilance is the **optimal state of the CNS**, when a person is able to **adequately respond** to changes in the external environment.

From a neurophysiological point of view, the basic mechanism is **reticular formation**. It includes the **ARAS** (ascending reticular activating system) = non-specific afferent pathways leading impulses from the periphery to the stem, diencephala and to the cortex; this is a very old integration system.

Psychiatric definition of consciousness: It is the ability to be *aware of oneself* as an *individuality* in relation to the surrounding world; the ability to *correctly interpret* ones own experiences.

- If *vigilance is altered* → **quantitative disorder**.
- If the ability to self-identify or experience experiences is "altered" → "qualitative disorder".

Quantitative Disorders

They arise in ARAS lesions^[1].

From a time point of view, we divide them into **long-term** *and* *short-term*.

Short term

Syncope

Short-term unconsciousness immediately threatening a person's life (e.g. when driving a car, falling from a height, etc.).

 For more information see *Syncope*.

Epileptic seizure

Irritating lesions. They have a longer development. Unconsciousness - confusion - urinary/faecal incontinence - gradual awakening.

 For more information see *Epileptic seizure*.

Metabolic diseases

Conditions that do not end on their own. Hypoxia, hypoxemia, hypoglycemia.

Long term

Somnolence

A state of *increased sleepiness*. The patient has little spontaneous activity, controls the sphincters. Responds to **words**.

Sopor

Deep sleep from which the patient can be awakened by **painful stimuli**. It does not control the sphincters.

Coma

The most severe state of impaired consciousness. *They extinguish basic reflexes*, e.g. the pupils stop responding to light. It does not control the sphincters. Respiratory and circulatory disorders occur.

- *Mild coma* - mydriasis, mild photoreaction.
- *Deeper Coma* - miosis.
- *Deepest coma* - paralytic mydriasis without response.

 For more information see *Coma*.

Brain Death^[2]

It occurs when there is a complete irreversible loss of all brain functions. Spontaneous breathing stops, the photoreaction is extinguished

and response to nociceptive stimuli. Trunk reflexes are also extinguished. During angiography, cerebral circulation arrest is demonstrated. Brain death is considered the death of an individual. Authorizes the physician to terminate resuscitation and use appropriate organs for transplantation. However, this is governed by strict criteria (formation of an expert committee, determination of the cause of the coma, angiographic findings, etc.).

Causes of quantitative disorders of consciousness

- **Cerebral hypoxia.**
- It is also possible to reflexively evoke **emotions** (sight of blood).
- **Internal** causes: cardiological, circulatory, hypoglycemia, uremia, etc.
- **Intoxication.**
- **Surgical** causes: head injuries, concussions, contusions, etc.
- **Neurological** causes: cerebral embolism, hemorrhage, malacia, inflammation, epilepsy, etc.

Differential diagnosis of quantitative disorders of consciousness

A simple device for use on a patient - A Dozen Causes of Unconsciousness

Structural lesions

Often accompanied by focal neurological findings with a picture of rostrocaudal deterioration. When the central structures or both hemispheres are affected, the image can be symmetrical, imitating metabolic/toxic involvement.

Metabolic and toxic lesions

Symmetrical dispersion neurological symptomatology. There is no rostrocaudal deterioration. Pupils mostly symmetrical, miotic with a positive photoreaction. Often stray movements of the bulbs and involuntary movements of other parts of the body. Mental disorders.

Apalic Syndrome (Persistent Vegetative State)

Severe corticosubcortical lesion with preserved brainstem function. Trunk reflexes are preserved, including breathing, the eyes involuntarily follow the surroundings, **but the patient does not perceive the surroundings**. No cognitive functions are present. The most common cause is global hypoxia of the brain and diffuse axonal damage. The condition is usually irreversible. In some cases, the condition may improve. First come primitive food (putting things in the mouth) and sexual (touching staff, masturbation) reactions, later confusion, slowed mental functions, sometimes complete recovery.

Locked-in syndrome

This is a loss of momentum due to interruption of the corticospinal and corticobulbar pathways. **Consciousness is preserved and the patient can be fully lucid!** With the classic form, the patient is able to blink and move vertically bulbs.

Psychiatric Affection

For example abuli or catatonia. However, vigilance is maintained in both cases.

Qualitative disorders

Vigilance is more or less preserved.

However, there is an "alteration" of some "psychic functions" - i.e.:

- impairment of the ability to identify the external world;
- is disturbed perception, thinking, affectiveness, memory, action etc.

Division

1. **dazzled consciousness:**
 1. *confusion*,
 2. *delirium*,
2. **gloomy states.**

Demented Consciousness

Confusion (amence)

Symptoms:

Disintegrated Content of the Psyche,

Perception is broken,

Illusions and hallucinations,

Thinking disorder.

Facts can be **misinterpreted,**

- *autopsychic disorientation* (he doesn't know who he is),
- *"allopsychic disorientation"* (does not know where he is),
- *time disorientation* (doesn't know when it is).

These are "short-term" and "long-term" conditions (up to weeks).

After the end of the ament state, the patient has **amnesia** for the duration of the ament.

Causes:

Internal: atherosclerosis of cerebral arteries, diabetes mellitus etc.

Delirium

It is an **organic mental disorder.**

Characterized by a group of *psychological and behavioral symptoms* caused by brain dysfunction.

Former names: **acute organic cerebral syndrome, acute confusional state.**

Incidence: in hospital 10-15% (elderly 30-50%).

Diagnostic criteria:

- **reduced long-term attention** to external stimuli;
- disorganization of thinking, leads to **incoherence**;
- at least **two** of the following symptoms:
 1. *reduced level of consciousness,*
 2. *disorders of perception,*
 3. *sleep-wake cycle disorders,*
 4. "decrease or increase in psychomotor activity",
 5. *disorientation by time, place, person,*
 6. *memory degradation.*

Development *over a short period of time* (maximum days) and **fluctuations**.

Mortality is determined not only by the causative disease but also by causes given by the condition (rupture of infusion vessels, falls, etc.).

Etiology:

- rarely caused by brain disorder itself, usually **systemic body disorder**:
 - *alteration of cerebral blood flow* (hypotension, hypertension, bradycardia, shock);
 - "brain disorders" (epilepsy, post-stroke condition, trauma, infections, tumors, bleeding);
 - "endocrinopathy" (hypo- and hyperpituitarism, hyper- and hypoparathyroidism, hyper- and hypothyroidism, m. Cushing, m. Addison);
 - "metabolic disorders" (hepatic encephalopathy, uremia, hyper- and hypoglycemia, acute pancreatitis, mineral concentration disorders, porphyria, vitamin deficiency, malnutrition, acid-base balance disorders etc.);
 - *systemic infections* with fever and sepsis;
 - industrial "poisons" (CO, CO₂, organic solvents, etc.);
 - "high-risk patients" (elderly, demented, operated under general anesthesia);
 - *drugs* causing delirium in susceptible individuals - analgesics, opiates, antiarrhythmics, anticholinergics, antihistamines, antipsychotics and many others.

Clinical signs:

- **common prodromes**: night terrors, anxiety, headaches;
- **in developed delirium** - psychological symptoms: deterioration of short-term memory, attention difficulties, perception disorders, illusions, hallucinations, delusions, disorientation;
- evidence of **cortical dysfunction** - alexia, apraxia, agnosia, dysgraphia and aphasia;
- **behavioral disorders**;
- **somatic symptoms** - symptoms of general brain dysfunction (tremor, ataxia, dysarthria, myoclonus);
- symptoms of **autonomic dysfunctions** (increased temperature, tachycardia, increased blood pressure, incontinence, sweating, mydriasis).

Differential diagnosis:

- rule out *dementia*, which is often complicated by delirium;
- exclude *depression, catatonia*.

Therapy:

- the patient must be **protected from himself** to avoid self-harm → hospitalization, courting, enclosures, etc.
- **pharmacotherapy**:
 - "specific treatment" if we know the cause (hypotensive drugs, benzodiazepines for abstinence, etc.);
 - *symptomatic treatment* (haloperidol);
 - "internal" symptomatic treatment (infusion therapy, cardiotonics, antibiotics, etc.).

Dull states (obnubilation)

Similar symptoms to delirium, but differs in the *sudden loss and sudden return of consciousness*.

Amnesia for the duration of the disorder.

Etiology:

- in **epilepsy** (psychomotor);
- after **head trauma**;
- after **stroke**;
- **starvation**;
- **endogenous psychoses**;
- *pathic* drunkenness, pathic affect;

- **dissociative disorders.**

Forms:

Stuporous Form:

- *poorest* for symptoms;
- the patient does not move, the gaze is fixed indeterminately, there is no facial expression;
- does not rage, does not eat, incontinence, catatonic stupor, melancholic stupor, dissociative.

Delirious Form:

- *opposite stuporous*,
- constant movement, noisy, increased facial expressions and motor skills;
- severe anxiety, delusions, aggression;
- appears in pathic drunkenness, amok (tropics).

Automatic (vigilambulatory) form:

- the patient behaves inconspicuously;
- at first glance, he is *as if conscious*, but he performs *acts contrary to a healthy personality*;
- does not speak, but answers;
- *fugues* present;
 - the sick person travels unexpectedly → takes care of himself on the way;
 - the target is familiar, emotionally significant places;
 - there is complete amnesia on the fugue;
 - tends to be of epileptic or dissociative etiology.

Ganser syndrome,

 For more information see Ganser Syndrome.

- rarer, *hysterical stupor*;
- often in custody = *custody reaction* (result of criminal activity);
- appropriate but incorrect answers give the impression of approval (instead of greeting, he barks, gives a different date of birth - a different century, etc.);
- is debatable.

Assessment of consciousness

We monitor the patients attention, ability to react, and his mental and motor activity. When assessing the state of consciousness, we assess whether the patient is oriented to **place** (does he know where he is?), **time** (does he know what year is it?) and **person** (does he know who he is?).

If these abilities are weakened, we refer to it as *obscured consciousness*. We distinguish between 3 basic options. **Somnolence means the patient is sleepy but can be easily awakened.** *Sopor* is a deeper disorder where the patient is in a deep sleep and can be awakened by a painful stimulus. **Coma** is the most serious disorder of consciousness, the patient cannot be awakened and his reactions die out.

We divide consciousness disorders into *qualitative* and *quantitative*. Among the qualitative disorders are **amence** (confusion), the patient is disoriented in time and place (disorders of perception and restlessness may appear), and **delirium**. Quantitative disorders include the already mentioned syncope, sopor and coma.

Impairment of consciousness can accompany some disease states. Impairment of consciousness occurs, for example, when brain tissue is damaged (hemorrhage, tumor, inflammation, injury), when cerebral blood flow is impaired (thrombosis, embolism), during circulatory failure, in diabetes mellitus or intoxication.

Glasgow Coma Scale

The Glasgow Unconsciousness Scale, modified for children, is used **to assess the state of consciousness**. To assess the state of consciousness **in children under 3 years of age, the Best Possible Coma Score scale** is developed based on the assessment of maximum abilities with respect to maturation (*Reilly et al.*).

The scale helps to assess the patient's state of consciousness and the changes that occur during hospitalization.

The resulting score is created by the sum of three values, where each numerical value corresponds to the highest achieved degree of the patient's response to a given stimulus. (The score may be skewed by associated diseases or disorders of the patient, it does not evaluate the lateralization of symptoms.)

Scale

eye opening	adults and older children	little children
1	does not open	does not open
2	open by pain	open by pain
3	open by voice	open by voice
4	open spontaneously	open spontaneously
Verbal response		
1	none	none
2	incomprehensible sounds	moans by painful stimuli
3	individual words	shouts or cry by painful stimuli
4	inadequate speech	screams spontaneously, cries, inappropriate reactions
5	adequate speech	hums, yells, watches the surroundings, turns to the sound
Motor response		
1	none	none
2	non-specific extension at the site of painful stimuli	non-specific extension at the site of painful stimuli
3	non-specific stimulation by painful stimuli	non-specific stimulation by painful stimuli
4	escape reaction by a painful stimulus	escape reaction by a painful stimulus
5	targeted defense response to a painful stimulus	targeted defense response to a painful stimulus
6	adequate motor response	normal spontaneous mobility
Evaluation		
15-13	no or mild failure	
9-12	moderate disorder	
up to 8	serious disorder	

Evaluation

- GCS values can only range from **15 to 3** . For a rough assessment of the patient's condition, the disorder of consciousness can be divided into three stages:
 - **mild** (GSC 15-13),
 - **intermediate** (GSC 12-9),
 - **severe** (GSC 8-3) impaired consciousness.
- In order to correctly determine the score, it is necessary to reflect in the evaluation of other comorbidities that affect the result of the evaluation, but are not a manifestation of a disorder of consciousness. We do not evaluate localized pathologies, but the overall condition of the CNS. E.g. Of course, GCS 15 is also achieved by a quadriplegic patient with expressive aphasia, although this does not seem so at first glance. In contrast, muscle relaxation, intubation or analgesia make evaluation impossible.
- GCS assessment should be performed at the first contact with the patient, especially in conditions related to CNS and conscious damage.

Calculation

MediaWiki:Lékařská kalkulačka/GCS *We are currently working on a medical calculation.*

Assessment of Brainstem Function^[2]

It is carried out through the equipment of trunk reflexes:

Oculocephalic Reflex

The unconscious patient lies on his back, the examiner holds the patients head with both hands. The eyes of the unconscious fixate on a point in front of them. The examiner quickly and gently turns the head from side to side, while the patients eyes always fixate on one point, i.e. they turn against the direction of movement. This finding indicates intact trunk functions and a lesion in the diencephalon or hemispheres. If the eyes do not fixate on one point and rotate with the head, this would indicate a trunk lesion. The test is not performed if a cervical spine injury is suspected.

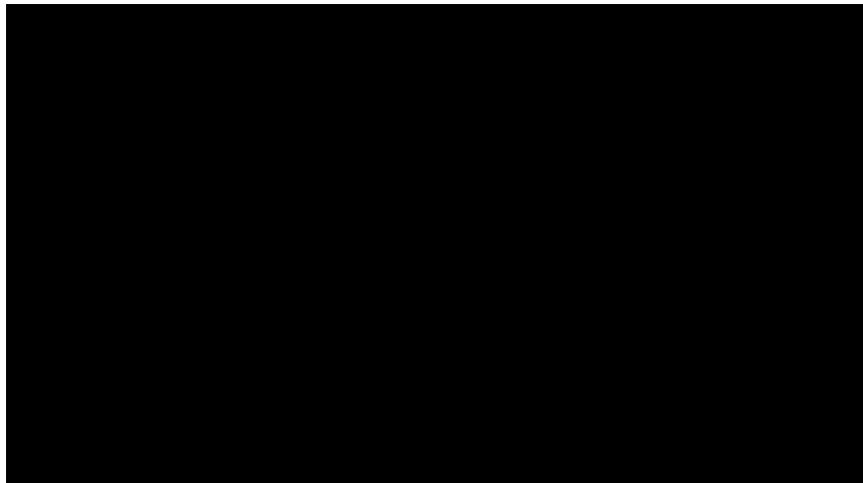
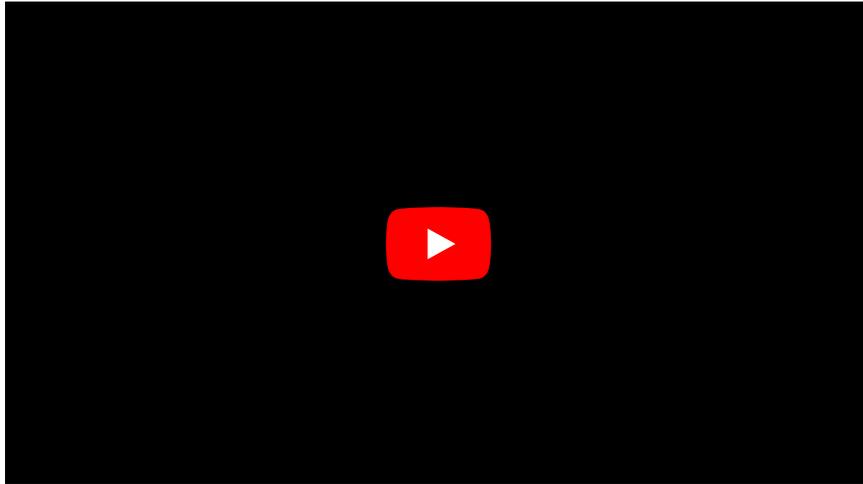
Oculovestibular Reflex

The patient lies on his back, the examiner flexes his head by approx. 30°. 20 ml of cold water (0 °C) is slowly applied to the external ear canal. With intact trunk functions, after a while the eyes deviate to the side of irritation. This would not occur with a trunk lesion. If the patient was not unconscious, nystagmus against the side of irritation

would also be provoked. If warm water were used and the patient was not unconscious, the nystagmus would be in the direction of irritation. The test is performed with an intact eardrum.

Investigations focused on the precipitating cause of the disturbance of consciousness

- Blood - biochemical, hematological, hemocoagulation, toxicological examination, examination of the internal environment.
- Urine.
- Cerebrospinal fluid.
- Internal examination + EKG.
- Imaging methods - CT, magnetic resonance, ...
- Sonography.
- Psychiatric examination.



Links

Related Articles

- Acute conditions in neurology and disorders of consciousness/PGS
- Glasgow Depth of Unconsciousness Scale
- Apalic syndrome
- Vigilance
- Lucidity
- Unconsciousness
- Causes of unconsciousness to remember
- General examination of the patient
 - Position, Gait and Mobility Examination
 - Examination of body constitution and nutritional status
 - Hydration Status Examination
 - Examination of skin and skin adnexa
 - Meningeal symptoms

External links

- Disorders of consciousness (<http://mefanet.lfp.cuni.cz/clanky.php?aid=215>)

References

- BENEŠ, George. *Study Materials* [online]. [cit. 2010-02-24]. <<http://jirben.wz.cz>>.

References

1. OBLIVIOUS, Sonia – RUŽIČKA, Eugene – QUIET, George. *Neurology*. 1. edition. Galen, 2002. 368 pp. ISBN 80-7262-160-2.
2. AMBLER, Zdeněk. *Fundamentals of Neurology*. 6. edition. Galen, 2006. 0 pp. ISBN 80-7262-433-4.
3. STAŇKOVÁ, M. *České ošetrovatelství 6 – Hodnocení a měřící techniky v ošetrovatelské praxi*. 1. edition. Brno : Institut pro další vzdělávání pracovníků ve zdravotnictví, 2000. ISBN 80-7013-323-6.
4. ROWLETT, Russ. *How Many? A Dictionary of Units of Measurement* [online]. ©2001. The last revision 2001-07-30, [cit. 2009-10-28]. <<http://www.unc.edu/~rowlett/units/scales/glasgow.htm>>.