

MUNI
MED

Disorders of consciousness, convulsions, seizures

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Learning outcomes

- the student will be able to **recognize a qualitative and quantitative disorder of consciousness** and determine its severity
- the student will learn a **systematic procedure in a patient with a disorder of consciousness of unclear etiology** leading to the discovery of the cause of the disorder of consciousness
- the student will learn to **distinguish status epilepticus and uncomplicated convulsive conditions**, its severity
- the student will learn a **systematic procedure in a patient with a seizure** and the choice of appropriate medication according to the severity of the condition

Content of the lecture

○ Disorders of consciousness

- assessment of consciousness
- causes of impaired consciousness
- algorithm in a patient with a disorder of consciousness of unclear etiology

○ Convulsions

- classification of convulsions
- epilepsy
- status epilepticus
- approach to a patient with seizures
- specific etiology of convulsions

Disorders of consciousness

consciousness

- vigility – ability to open eyes, diurnal rhythm (ARAS → hypothalamus → cortex)
- lucidity – compliance the instructions (cortex)

disorder of consciousness (it can be related only to vigility or only to lucidity or both)

- qualitative – related to lucidity
- quantitative – related to vigility
- disorder of consciousness is caused by conditions **affecting both cerebral hemispheres and subcortical structures or structural lesions in the brainstem**, regional process in the cerebral cortex causes only focal neurological deficit

Assessment of consciousness

1. step – **ABCDE algorithm**, focusing on D

Disability:

scoring systems

- Glasgow Coma Scale – eye opening, verbal answer, motor response
- AVPU – Alert/Verbal/Pain/Unresponsive
- FOUR score – in ventilated patients

brainstem reflexes

- photoreaction of pupils
- corneal reflex
- vestibulo-ocular reflex –CAVE – not if cervical spine injury is suspected
- cough reflex – suction

breathing pattern – bradypnea...

posturing – decerebrate, decorticate

Glasgow Coma Scale

	best response	score
eye opening response	eyes open spontaneously	4
	eyes open to verbal command	3
	eyes open to pain	2
	no eye opening	1
verbal response	oriented	5
	confused conversation	4
	inappropriate responses	3
	incomprehensible sounds or speech	2
	no verbal response	1
motor response	obeys commands for movement	6
	purposeful movement to painful stimulus	5
	withdraws from pain	4
	abnormal (spastic) flexion, decorticate posture	3
	extensor (rigid) response, decerebrate posture	2
	no motor response	1

Pediatric Glasgow Coma Scale

	best response	score
eye opening response	eyes open spontaneously	4
	eyes open to sound	3
	eyes open to pain	2
	no eye opening	1
verbal response	oriented - age-appropriate vocalization, smile, or orientation to sound; interacts, follows objects	5
	cries, irritable	4
	cries to pain	3
	moans to pain	2
	none	1
motor response	spontaneous movements (obeys verbal command)	6
	withdraws to touch (localizes pain)	5
	withdraws to pain	4
	abnormal flexion to pain (decorticate posture)	3
	abnormal extension to pain (decerebrate posture)	2
	no motor response	1

Causes of impaired consciousness

1. structural disorder of consciousness with focal syndrome

• trauma, vascular occlusion, intracranial haemorrhage, tumor, intracranial hypertension, focal infection, acute hydrocephalus...

2. impaired consciousness with signs of meningeal irritation

• CNS infection, acute subarachnoid haemorrhage

3. non-structural disorder of consciousness without focal or meningeal signs

• electrolyte disorders, endocrine causes (hypo/hyperglycaemia, myxoedema, Addison's crisis...), vascular causes (eclampsia, vasculitis, TTP...), intoxication, sepsis, drug reaction, epilepsy, vitamin deficiency (Wernicke's encephalopathy, pellagra), organ failure (hypoxia), hypoventilation, hepatic encephalopathy, uremia ..), others (hypo/hyperthermia, catatonia...)

Procedure in a patient with a disorder of consciousness of unclear etiology

1. ABC + neurological examination

- GCS < 8 → OTI, convulsions → anticonvulsant drugs

2. laboratory examination

- glycaemia, electrolyte imbalances → correction

3. computed tomography of brain

- structural lesions → surgical intervention/antiedematic therapy

4. lumbar puncture

- neuroinfection → therapy

5. CT-angiography

- acute vascular occlusion → thrombolysis, mechanical recanalization

Procedure in a patient with a disorder of consciousness of unclear etiology

6. toxicology

- intoxication → therapy

7. extended laboratory and clinical examination

- organ dysfunctions, endocrinological disorders → targeted therapy

8. EEG

- non-convulsive status epilepticus → anticonvulsant drugs

9. magnetic resonance

- targeted therapy

- always look for a medical history (medication, abusus, depression, convulsions...)

Delirium

- **qualitative disorder of consciousness**, usually caused by an organic disorder, characterized by a group of psychological and behavioral symptoms caused by brain dysfunction
- **causes**: alterations in blood flow to the brain, brain disorders, infections, metabolic disorders, endocrinopathy, poisoning, effects of drugs
- **clinical symptoms**: prodromes (dreads, headache...), psychotic symptoms (hallucinations, memory problems...), behavioral disorders, cortical dysfunctions (alexia, apraxia...), somatic symptoms (tremor...), autonomic dysfunction (tachycardia, fever...)
- **therapy**: protection of the patient from self-harm, specific treatment (if we know the cause), symptomatic treatment

Convulsions, seizures

- **convulsions** – uncoordinated, involuntary muscle contractions
- main therapeutic goal – **to end convulsive activity**
(pharmacologically)
- accumulation of convulsive activity – life threatening condition
- symptom of pathological condition, it is necessary to find the etiology of convulsions
- **seizures:**
 - **epileptic** - tonic/clonic/tonic-clonic seizures
 - **non-epileptic**

Non-epileptic seizures

1. caused by physiological conditions

syncope, cardiovascular causes (especially arrhythmias), cerebrovascular disorders (TIA), migraines, neurological causes - dyskinesias (tics, non-epileptic myoclonus), dystonia, startle reactions, sleep disorders, periodic paralysis, metabolic and endocrine disorders, the effect of drugs and toxic substances, withdrawal symptoms

2. psychogenic seizures

panic attacks, unconsciously induced seizures (especially somatoform disorders), consciously induced seizures (pretended, simulated), personality and behavioral disorders (Münchausen's syndrome, in children MS by proxy)

Classification

1. Focal seizures

- **simple partial seizures** – motor, autonomic, visual... phenomena,
Todd's paralysis – a seizure is followed by a brief period of temporary paralysis, the paralysis may be partial or complete
- **complex partial seizure** – affects awareness, automatisms may occur, lose of consciousness
- **secondarily generalized seizures** – partial seizures evolving into generalized seizures, most often with tonic-clonic convulsions

Classification

2. primarily generalized seizures

- **absence (petit mal)** – loss of postural tone, sometimes automatisms or convulsions, typically childhood, frequent spontaneous remission in adolescents
- **generalized tonic-clonic seizures (grand mal)** – initially tonic convulsions, then clonic phase, due to increased sympathetic tone increased blood pressure, heart rate, mydriasis, sometimes cyanosis present, tongue bite
- **tonic seizures, atonic seizures, myoclonic seizures**

3. unclassified seizures

- neonatal, in infants

Epilepsy

- **recurrent convulsive activity** caused by chronic pathological process
- potential causes must be ruled out - electrolytic imbalance, trauma, hypoglycaemia...
- caused by an imbalance between excitatory and inhibitory mediators in central nervous system

Status epilepticus

- **continuous seizure lasting more than 5 min, or two or more seizures without full recovery of consciousness** between any of them
- **life threatening condition** – damage of CNS may occur, rhabdomyolysis, electrolytic imbalance, pulmonary oedema, coagulopathy, multiorgan failure
- **main therapeutic goal** – pharmacological suppression of pathological EEG activity by anticonvulsants while maintaining / restoring vital functions
- prognosis is related to the duration of SE, etiology, age

Status epilepticus

- **diagnostics** – clinical manifestations, pathological EEG

- **classification:**

 - convulsive SE

 - nonconvulsive SE – without convulsion activity

- **response to treatment**

 - persistent SE (non responsive to BZD)

 - refractory SE (non responsive to BZD and 2nd line antiepileptics)

 - super-refractory SE (lasting more than 24 hours)

Management of the patient

- ABCDE, vital signs monitoring, oxygen administration, i.v. access and control of glycemia + laboratory, to prevent patient injury

○ 1. line medication

- **benzodiazepines** – diazepam i.v., lorazepam i.v., midazolam i.m.
- alternative – rectal, intranasal application

○ 2. line medication

- **antiepileptics** – phenytoin, valproate, levetiracetam, (phenobarbital)
- persistent SE (failure of BZD, seizures lasting more than 20 min)

○ 3. line medication

- **intravenous anaesthetics** – propofol, thiopental, midazolam, (phenobarbital, ketamine), medically induced coma
- continuous EEG monitoring – goal - achieve burst suppression pattern
- SE longer than 40 min
- cooperation with a neurologist, possible CT, MRI, lumbar puncture, epileptosurgery
- always look for a medical history (medication, abusus, depression, convulsions...)

Specific etiology of convulsive activity

- **fever cramps** – in children between 6 months and 5 years of age, in case of fever, generalized (**uncomplicated**) or focal, prolonged or repeated (**complicated**), always necessary paediatric examination to rule out alternative serious reason, therapy – benzodiazepines
- **tetanic convulsions** – due to hypocalcemia and/or hypomagnesaemia, the trigger may be a psychological problem with hyperventilation (hyperventilation tetany due to respiratory alkalosis)

Specific etiology of convulsive activity

- **eclampsia** - tonic-clonic convulsions and/or unconsciousness in pregnant patients, previously preeclampsia or unmonitored pregnancy, necessary exclusion of other causes, eclampsia - decreased muscle tone and miosis (X epilepsy – increased muscle tone and mydriasis), therapy - delivery (acute C-section), symptomatic therapy
- **psychogenic non-epileptic seizures** - adolescents, after excluding the organic cause of convulsions, clinically as SE without finding an EEG, unresponsive to standard therapy

Take home message

- in case of impaired consciousness and convulsions/seizures, it is necessary to **follow the ABCDE algorithm with a special focus on D**
- impaired consciousness and seizures are a **manifestation of a pathological condition**, it is necessary to look for the etiology
- **status epilepticus is a life-threatening condition**, main therapeutic goal is **pharmacological suppression of pathological EEG activity**

Resources:

- MALÁSKA, Jan, Jan STAŠEK, Milan KRATOCHVÍL a Václav ZVONÍČEK. *Intenzivní medicína v praxi*. Praha: Maxdorf, [2020]. Jessenius. ISBN 978-80-7345-675-7.
- ČEŠKA, Richard, TESAŘ, Vladimír, Petr DÍTĚ a Tomáš ŠTULC, ed. *Interna*. Praha: Triton, 2010. ISBN 978-80-7387-423-0.

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