Neurological consequences of internal medicine diseases

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Neurological consequences of internal medicine diseases

- Secondary encephalopathies
  - Hypoxia-hypercapnia
  - Liver disease
  - Renal disease
  - Hypertension
  - Diabetes mellitus
  - Endocrine diseases
- Electrolyte disturbances
- Cardiac diseases
- Malignant diseases
- Intoxication, poisoning
- Others
Secondary encephalopathies

- **Cause:** damage of other organ (than CNS) – duration of development is important
- Usually no focal neurological signs
- Metabolic alterations often leads to
  - difficulty of concentration, headache, fatigue, irritability, confusion, later disturbance of consciousness – EEG
  - convulsions, myoclonus, action tremor, asterixis – flapping tremor
- Na, K, Glu, Urea (BUN), Creatinine, NH3, Astrup, blood count, fT4, sTSH
- In case of severe and long lasting metabolic encephalopathy, the symptoms may remain even after treatment of metabolic disturbances!!!
- Differential diagnosis: intoxication, poisoning
Hypoxic-ischaemic encephalopathies

- There is not enough O2, no proper breathing, or no circulation
- Anaesthesia, mount climbing
- Suffocation/choking (blockage of the tracheal tube, aspiration, bilateral bronchopneumonia, weakness of respiratory muscles, poisoning with CO)
- No circulation (MI, ventricular fibrillation, cardiac arrest, shock, low blood pressure)
- Cortex .....................................brain stem
- Prognosis
Hypercapnia

• Emphysema, fibrosis, pulmonary restrictive disease, myasthenia gravis
• Headache, confusion, somnolence, action tremor, myoclonus
LIVER DISEASE: PARENCHYMAL AND/OR VASCULAR DECOMPENSATION

Proteins

NH4

Vena portae

Vena hepatica

NH4 Urea

Porto-caval shunt

Vena cava
Liver disease

- Hepatic encephalopathy - hyperammonaemia
  - proteins – microorganisms in bowels with urease enzyme – NH4
  - damage of the liver +/- porto-caval shunt – no utilisation of NH4 in the liver – hyperammonaemia
  - confusion, disturbance of consciousness, asterixis - flapping tremor, convulsion,
  - EEG: bilateral synchron slow waves, triphasic waves

- Coagulation disorders – bleeding

- Tendency for hypoglycaemia
Renal diseases

- **Uraemic encephalopathy - *uraemia***
  - Difficulty of concentration, fatigue, apathy, disturbance of consciousness
  - *myoclonus, action tremor, dysarthria, convulsion*

- **Uraemic neuropathy: uraemia + thiamin deficiency due to dialysis – burning feet, restless legs**

- **Dysequilibrium syndrome – osmotic gradient after rapid dialysis (EC→IC)**
  - headache, nausea, muscle cramps, convulsions, delirium

- **Dialysis dementia – after 3 years (Al intoxication)**
  - dysarthria, change of behaviour, myoclonus, dementia
IC | EC | Blood
---|---|---
Urea… | Urea… | Urea…

A F T E R D I A L Y S I S

Urea… | Urea… | Urea…

OSMOTIC GRADIENT
IC EDEMA
Renal diseases

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Hypertension

• Hypertensive encephalopathy
  – headache, irritability,
    later disturbance of consciousness, papilla-edema
  – treatment: decrease of blood pressure, but avoid
    sudden and pronounced decrease

• Headache (in the morning, occipital region)
• Macroangiopathy
  – Carotid stenosis, coronary disease, peripheral artery
disease
• Microangiopathy
  – Lacunar cerebral infarctions, retinopathy…
• Cerebral haemorrhage!!!
Diabetes mellitus - 1

- Hypoglycaemia – disturbance of consciousness, convulsions, variable neurological signs
- Hyperglycaemia (with or without ketoacidosis)
  - confusion, disturbance of consciousness, convulsions
  - with ketoacidosis: + Kussmaul breathing!
Diabetes mellitus - 2

- Macro- and microangiopathies - stroke
- Diabetic neuropathies
  - Symmetric, sensory polyneuropathy
  - Diabetic amyotrophy (motor fibres are affected, leading to proximal weakness, atrophy and pain in the lower extremity)
  - Autonomic neuropathy (orthostatic hypotension, impotence)
  - Ischaemic neuropathy (oculomotor nerve)
Endocrine diseases

- ACTH, corticosteroids, Cushing’s syndrome
  - above dose of 100 mg prednisolone/day – 5%
  - hyperactivity, irritability, insomnia, euphoria, hypomania, confusion,
- Hyperthyreosis, thyreotoxicosis
  - tremor, irritability, confusion, convulsions
- Hypothyreosis
  - somnolence, slowness, neuropathy, periodic paralysis, weakness, dementia
- Benign intracranial hypertension (dysmenorrhoea)
Electrolyte disturbances
Duration of development is very important!

- **Hypokaliaemia**: muscle weakness
- **Hyperkaliaemia**: cardiac diseases, ventricular arrhythmia, muscle weakness
- **Hypocalciaemia**: paraesthesia, muscle cramps, convulsions (frequently caused by hyperventillation)
- **Hypercalciaemia**: muscle weakness, myoclonus, headache, nausea, disturbance of consciousness
## Electrolyte disturbances - Na

<table>
<thead>
<tr>
<th>Hypernatriaemia ADH↓</th>
<th>Hyponatriaemia ADH↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Head trauma, damage of hypophysis, no fluid intake</td>
<td></td>
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<tr>
<td>- Myoclonus, convulsion, asterixis, somnolence</td>
<td></td>
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<tr>
<td>- Decrease of IC volume</td>
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<tr>
<td>- Decrease of brain volume</td>
<td></td>
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<tr>
<td>- Tearing of bridging veins, subdural haematoma</td>
<td></td>
</tr>
<tr>
<td>- Head trauma, encephalitis, meningitis, SAH, „water poisoning”</td>
<td></td>
</tr>
<tr>
<td>- Convulsion, confusion, disturbance of consciousness</td>
<td></td>
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<tr>
<td>- After rapid correction</td>
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<tr>
<td>- Central pontine myelinolysis</td>
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<tr>
<td>- Extrapontine myelinolysis</td>
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</table>
Central pontine myelinolysis

- Not only in alcoholics
- Demyelinisation
- Most pronounced in the centre of the pons
- Cranial nuclei are preserved
- Tetraparesis, pseudobulbar lesion, but pupillary reaction and eye movements are intact (locked-in syndroma)
- Rarely extrapontine localisation (thalamus, striatum, …)
Cardiac diseases
Global cerebral ischaemia

• Decrease of cardiac output due to heart valve disease (e.g. aortic valve stenosis), or decreased pump function (e.g. AMI, dilatative cardiomyopathy)

• Decrease of cardiac output due to arrhythmia, or transient asystolia (SSS, AV-block, vasovagal syncope, carotis sinus hyperaesthesia)

• Differentiation of syncope and epilepsy
  • Holter ECG,
  • Blood Pressure Monitoring,
  • Echocardiography
Epilepsy - syncope

- **Epilepsy**
  - Usually no preceding symptom
  - Tonic, then clonic phase, but only loss of posture is also possible
  - **Tongue biting, enuresis**
  - Postictal confusion

- **Syncope**
  - Pallor, blurred vision…
  - Loss of posture, rarely jerks
  - Tongue biting is rare, enuresis might occur
  - After gaining the consciousness, confusion ceases very fast

**ECG monitoring**
Global cerebral ischaemia

- Asystolia, severe hypotension e.g. during heart surgery, or other surgery in general anaesthesia with prolonged hypotension
  - Questions for the neurologists:
    - Why is he/she still unconscious??
    - What is the prognosis?

- Duration of global ischaemia, temperature

- The gray matter is much more sensitive than the white matter, and the cortex is more vulnerable than the brain stem.

- Watershed areas are also sensitive to ischaemia
Global ischaemia - diffuse hypoxia

• Reversible damage
• Cognitive deficit, confusion, changing of personality, cortical blindness, myoclonus, epilepsy, extrapyramidal symptoms
• Cortical damage, but preserved brain stem functions
  – Hypnoid and not hypnoid disturbance of consciousness
• Cortical and brain stem damage
• Brain death
Cardiological diseases-stroke

• Source of cardial embolisation - ischaemic stroke
  – Atrial fibrillation
  – Wall hypokinesis, or aneurysma after myocardial infarction
  – Dilatative cardiomyopathy
  – Arteficial heart valves
  – Infectious endocarditis

• Haemorrhagic transformation (reperfusion)
Cardiological interventions

- Heart surgery: embolisation, air embolism, global cerebral ischaemia - 2-4% stroke
  - Risk of stroke during heart surgery is further increased in case of significant carotid stenosis
- Coronarography, coronaria stent - 1% stroke
Haemorrhagic transformation

• Not rare after embolisation from the heart

• Causes:
  » embolisation
  » huge infarction
  » embolus is dissolved
  » spontaneous reperfusion, hyperperfusion of infarcted tissue
  » haemorrhagic transformation

• Therefore:
  – Patients with **atrial fibrillation** should not be anticoagulated in the acute phase of ischaemic stroke. Antiplatelet drug is enough in the first week.
  – Antithrombotic drugs should be avoided for 24 hours after intravenous thrombolysis.

**BUT later should be anticoagulated!!!
Malignant diseases - metastases

- **Cerebral metastases:** lung, breast, melanoma, colon, rectum, kidney
  - Cerebral metastasis: melanoma (75%), testis (55%), bronchus (35%)

- **Meningeal metastases:** breast, lung, gastrointestinal tu., melanoma, leukaemia (lymphocytic, acute), lymphoma
  - Headache, back pain, polyradiculopathy, damage of cranial nerves, confusion, rarely hydrocephalus

- **Spine, skull (bone) metastases:** breast, prostate, myeloma
  - Usually there are no focal neurological signs, but painful!
  - Exception: cranial base – cranial nerve lesions.
  - Exception: fracture of vertebra – myelon compression.
Malignant diseases - paraneoplasia

- Due to indirect effect of systemic tumor on the CNS
- No compression, no direct involvement
- Ig against the neuron, neuronal damage, lymphocytes
  - Anti Hu, Anti Ri, Anti Yo, VGCC
- It may precede the signs and symptoms of the primary tu.!!!
- Treatment: removal of the primary tumor
- CSF might be normal, or mild increase of protein content and cell number ↑
- CT, MR usually negative, rarely T2 ↑, or atrophy
- Known form: Lambert-Eaton syndrome
**Paraneoplastic syndromes**

- **Paraneoplastic cerebellar degeneration**
  - Lung (small cell cc), breast, ovarium, Hodgkin’s disease, …

- **Paraneoplastic sensory neuropathy**
  - Lung – distal onset → proximal signs, cranial nerves, vegetative signs

- **Paraneoplastic opsoclonus-myoclonus-ataxia**
  - Neuroblastoma (children) + breast, lung

- **Paraneoplastic encephalomyelitis**
  - Bronchus, lung – confusion, hallucination, agitation, dementia

- **Necrotizing myelopathy + motor neuropathy**
  - Bronchus, lymphoma (Hodgkin) – mainly motoros symptoms, ~ALS
Malignant diseases – complications of treatment

Treatment: cytostatic drugs, immunosuppression

– polyneuropathy
– anaemia - dizziness
– infections – brain abscess, herpes zoster, meningitis
Intoxications, poisoning

- Benzodiazepines
  - (flumazenil-Anexate)
- Alcohol, metanol
- Carbamazepine (iatrogen)
- Coumarol, warfarin (iatrogen)
- CO, CO2
Others

• Stomach surgery, no intake of B12 vitamin (vegetarians), no absorption of B12 vitamin
  → anaemia perniciosa
  → funicular myelosis
  (combined degenerative disorder of spinal cord)

• Causes of demetia might be
  – deficiency of B12 vitamin
  – hypothyreosis

• Thrombophilia: sinus thrombosis, cerebral vein or sinus thrombosis
# Neurological complications of chronic alcoholism

<table>
<thead>
<tr>
<th>Site of damage</th>
<th>Disease</th>
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<tbody>
<tr>
<td>Muscles</td>
<td>Myopathy</td>
</tr>
<tr>
<td>Peripheral nerve</td>
<td>Polyneuropathy-N</td>
</tr>
<tr>
<td>Optic nerve</td>
<td>Alcoholic amblyopia-N</td>
</tr>
<tr>
<td>Myelon</td>
<td>Myelopathy-N</td>
</tr>
<tr>
<td>Diencephalon</td>
<td>Wernicke disease-N</td>
</tr>
<tr>
<td>Brainstem</td>
<td>Korsakoff disease-N</td>
</tr>
<tr>
<td>Cerebellum</td>
<td>Central pontine myelinolysis</td>
</tr>
<tr>
<td>Cortex</td>
<td>Vermis atrophy-N</td>
</tr>
<tr>
<td>Corpus callosum</td>
<td>Cerebral atrophy-?</td>
</tr>
<tr>
<td></td>
<td>Marchiafava-Bignami disease-?</td>
</tr>
</tbody>
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