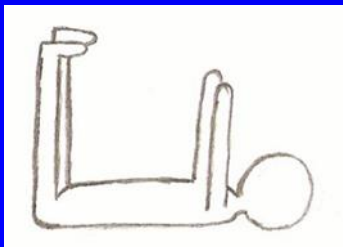


Unconsciousness due to internal diseases - - differential diagnosis and management

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Content

- Definitions
- Patophysiological mechanism
- List of reasons
- Dif. dg. approaches
- Examinations
- Management
- Syncope (Guideliness ESC 2018)

Definition of unconsciousness (coma)

- The most severe quantitative disturbance of consciousness
- Somnolence - sopor - coma.
- Glasgow Coma Scale ≥ 7

Glasgow Coma Scale (adult)

Feature	Response	Score
Best eye response	Open spontaneously	4
	Open to verbal command	3
	Open to pain	2
	No eye opening	1
Best verbal response	Orientated	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No verbal response	1
Best motor response	Obeys commands	6
	Localising pain	5
	Withdrawal from pain	4
	Flexion to pain	3
	Extension to pain	2
	No motor response	1

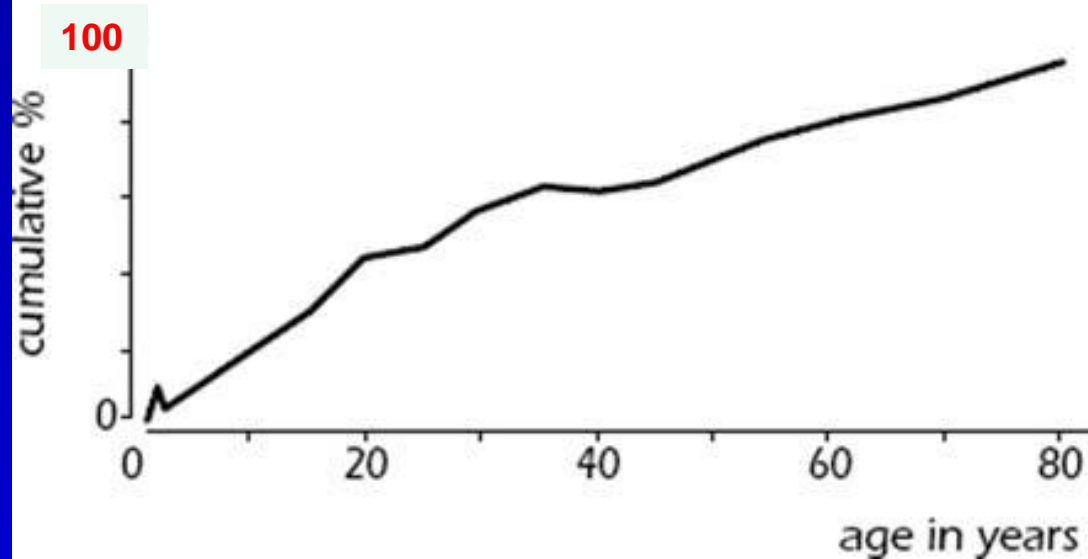
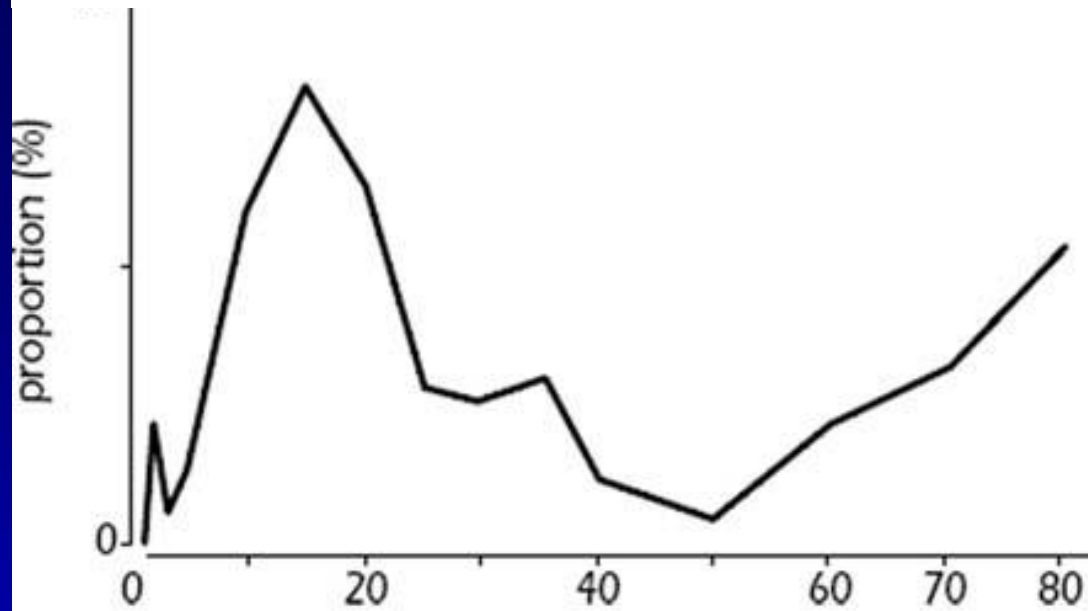
Classification of unconsciousness by duration

- **Transient lost of consciousness (TLOC) – lasting in seconds/minutes**
- **Prolonged unconsciousness/coma**
- lasting tens of minutes or more

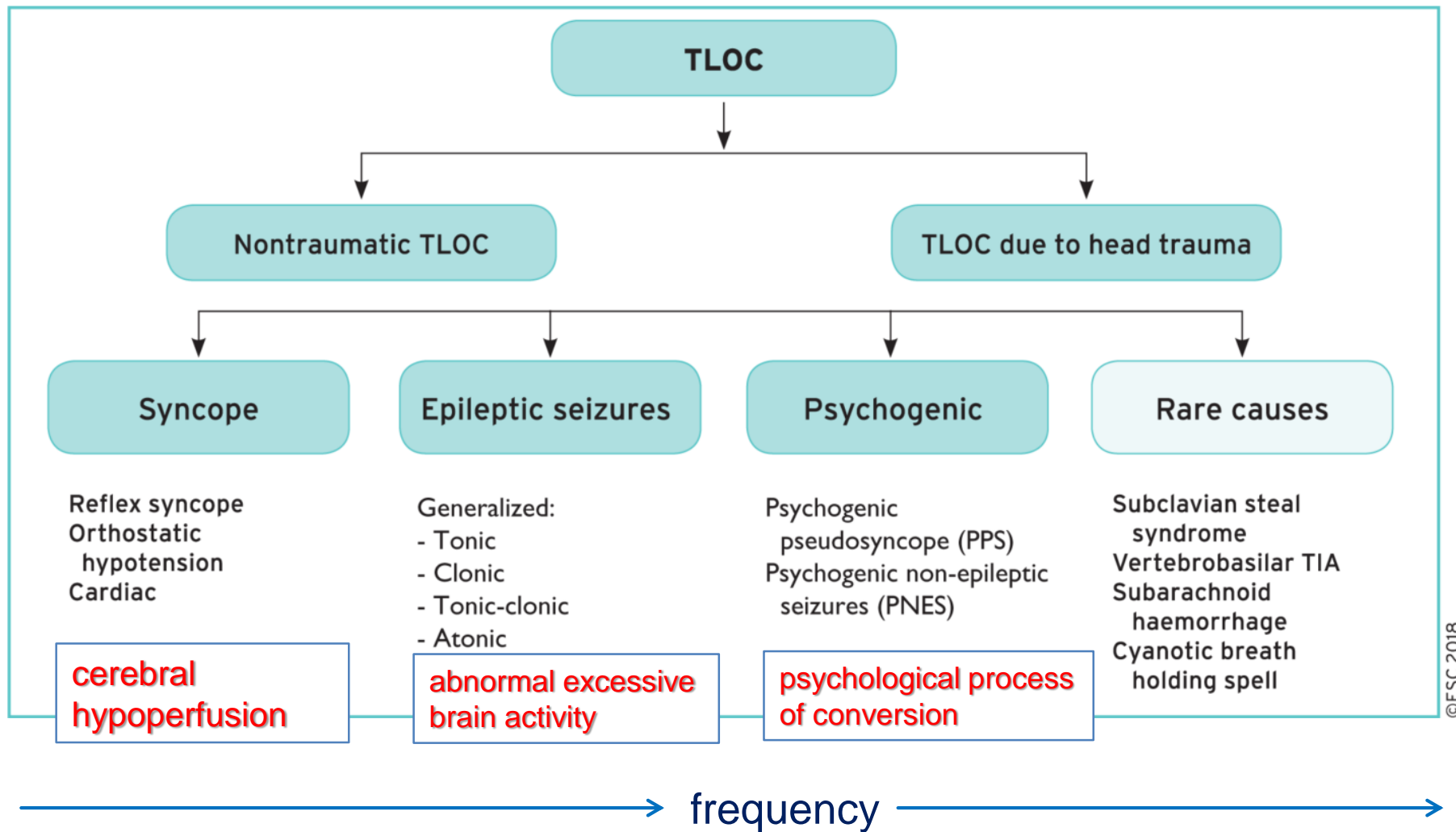
Transient lost of consciousness (TLOC)

- Short duration LOC
- Lost of responsiveness
- Lost of muscle tone
- Amnesia !

TLOC regarding age



Classification of TLOC by mechanism



„Rare“ causes of TLOC

Vertebrobasilar TIA – focal neurological signs, LOC longer

Subclavian steal sy – with arm exercises

Subarachnoid haemorrhage – extreme headache

Cyanotic breath-holding spells - young child reacts to sudden pain or upset by not breathing, turning pale or blue and then fainting

Psychogenic TLOC

Psychogenic pseudosyncope
(PPS)/pseudocoma – duration minutes to hours, up to several times a day

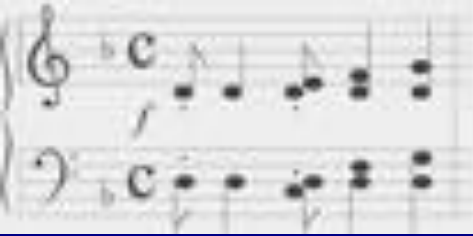
Psychogenic non-epileptic seizures
(PNES)

Situations incorrectly diagnosed as TLOC

Falls – no unresponsiveness, no amnesia

Absence epilepsy – no falls but amnesia

.....



Syncope

- **Definition:** sudden temporary short duration loss of consciousness with loss of postural tone with spontaneous recovery with or without short duration prodromal symptoms
- **Underlying mechanism:** transient cerebral hypoperfusion

Types of syncope

- Reflex (neurally-mediated) („faint“)
- Orthostatic (hypotension) syncope
- Cardiac:
 - Arrhythmias
 - Structural cardiac diseases
 - Cardiopulmonary and great vessels diseases

Reflex (neurally-mediated) syncope

Vasovagal (VVS):

- orthostatic VVS: standing, less common sitting
- emotional: fear, pain (somatic or visceral), instrumentation, blood phobia

Situational:

- micturition
- gastrointestinal stimulation (swallow, defaecation)
- cough, sneeze
- post-exercise
- brass instrument playing, laughing,

Carotid sinus syndrome

Without apparent triggers and/or atypical presentation

Syncope due to orthostatic hypotension

Mechanisms: venous pooling after prolonged bed/sitting rest, during exercise, after meals

Types of orthostatic syncope

Drug-induced OH:

vasodilators, diuretics, phenothiazine, antidepressants

Volume depletion:

haemorrhage, diarrhoea, vomiting, etc.

Primary autonomic failure:

pure autonomic failure, multiple system atrophy, Parkinson's disease, dementia with Lewy bodies

Secondary autonomic failure:

diabetes, amyloidosis, spinal cord injuries, autoimmune autonomic neuropathy, paraneoplastic autonomic neuropathy, kidney failure

Cardiac syncope

- **Arrhythmias** as primary cause:

Bradyarrhythmias:

- sinus node dysfunction
- atrioventricular conduction system disease

Tachyarrhythmias:

- supraventricular
- ventricular

- **Structural cardiac diseases:**

valve (aortic) stenosis, HOCM, obstruction by cardiac masses (atrial myxoma, thrombi etc.), pericardial disease/tamponade, congenital anomalies of coronary arteries, prosthetic valve dysfunction, AMI/ischaemia

- **Cardiopulmonary and great vessels diseases:**

pulmonary embolus, acute aortic dissection, pulmonary hypertension

Syncope occurrence

- 30% of population experience syncope at some time
- Syncope accounts for 1-3% of hospital admissions

Examinations for TLOC

- Carotid sinus massage
- **BP sitting + after standing up**
- **ECG**
- **ECHO**
- ECG monitoring, Holter, Event recorder, Loop recorder, Implantable loop recorder
- Exercise stress testing
- (Head-up) Tilt Table Test (HUTT)
- Invasive electrophysiology
- Neurologic exam
- Head CT/NMR
- EEG
- Carotid US
- Laboratory

External loop recorder



Implanted loop recorder

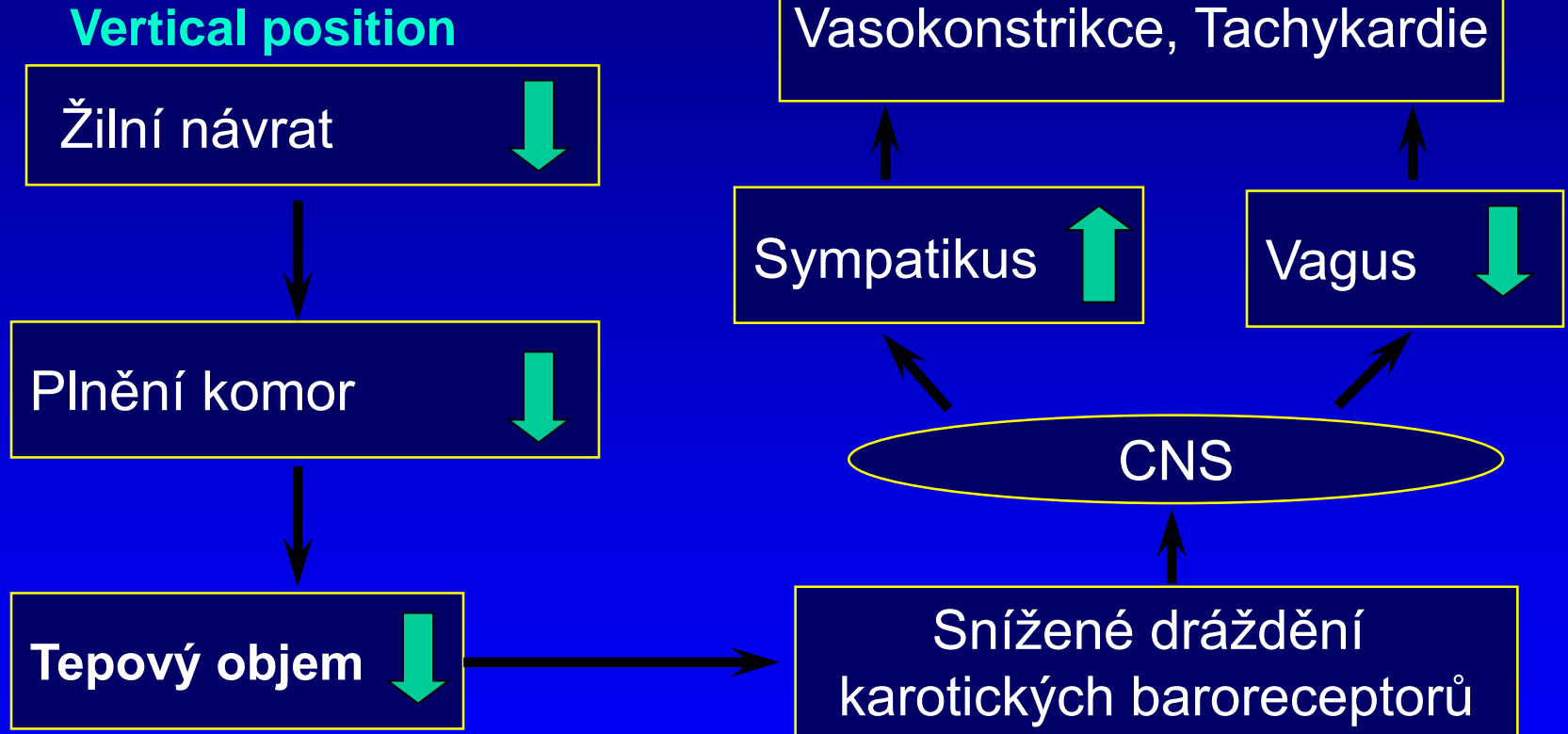


Differential diagnosis of syncope

- Medical history !!!
- Examinations (BP after standing up,)
- Exclusion of cardiogenic syncope
- Exclusion of reasons with easy dg
- *Frequent recurrence \Rightarrow probably benign reason*
- *Usually some delay is not danger*

Orthostatic hypotension/syncope

Synkopa

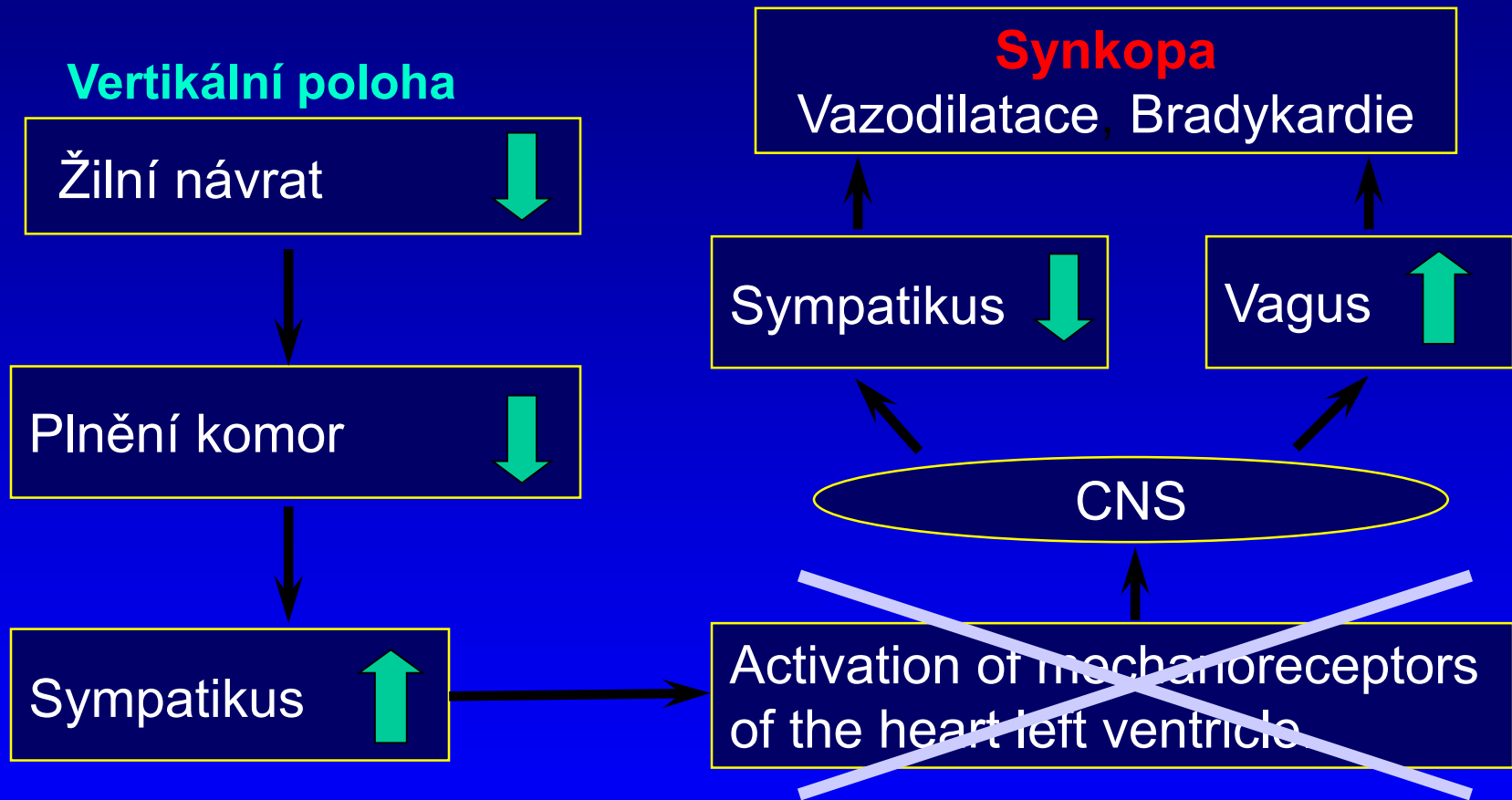


Orthostatic syncope – insuf./delayed vasoconstriction in respons to orthostatic stress due to autonomic nervous system failure

Orthostatic hypotension/syncope

- Induction (drug, alcohol, exercise, post-prandium, volume depletion, ...)
- Dg: posture hypotension + pre-syncope
- Treatment

Pathophysiology of vasovagal syncope (Bezold-Jarisch reflex)



However, vasovagal syncope was also documented in individuals after orthotopic heart transplantation..

Vasovagal (vasodepressor/neurocardiogenic) syncope

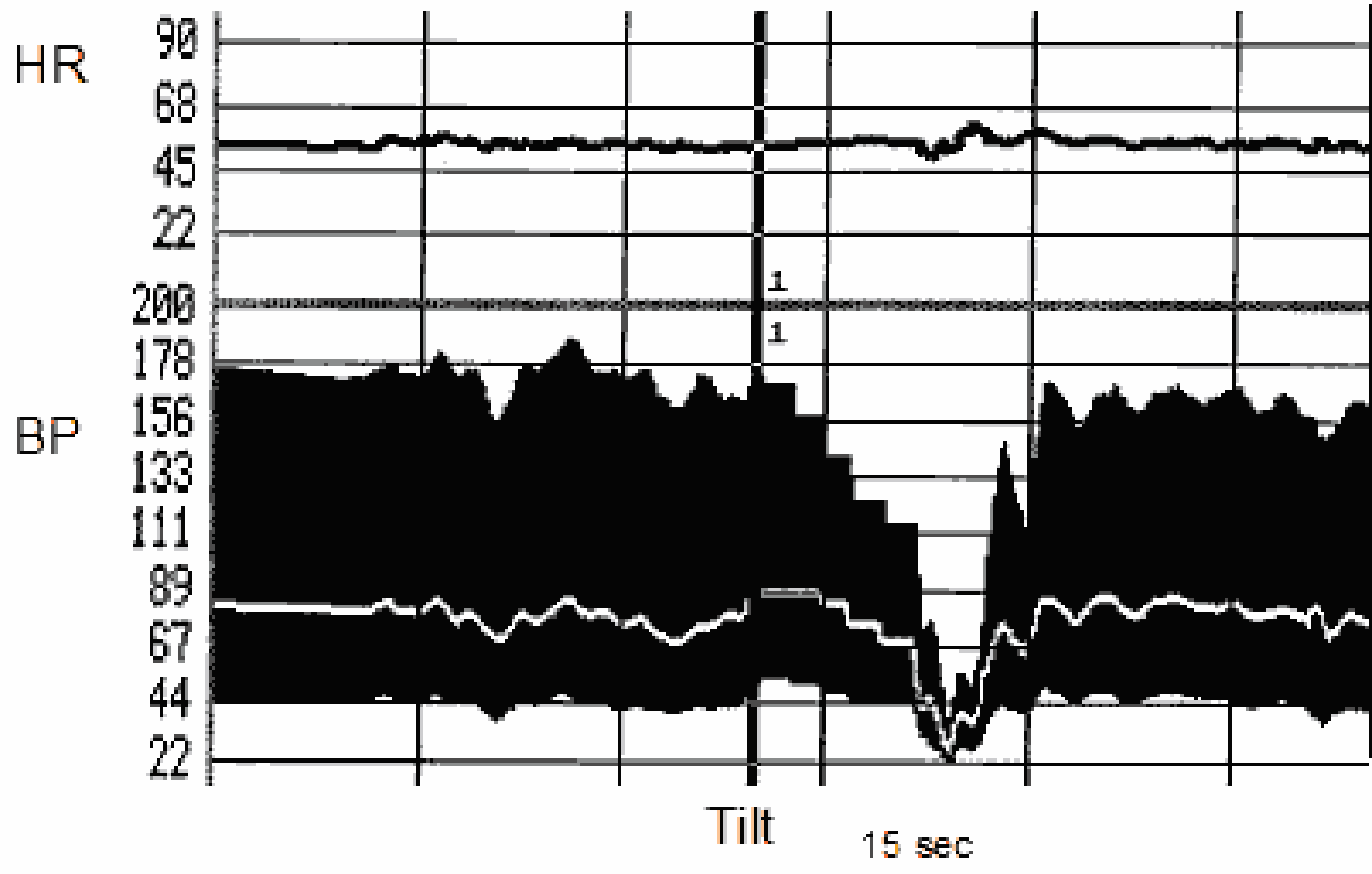
- 40% of all syncope
- Diagnose:
 - Precipitation by long standing, hot place, emotional distress, severe pain, fear, after meal etc.
 - Typical prodromal symptoms (dizziness, nausea, vomiting, ...)
 - Exclusion of other reasons (cardiac disease)
 - Head-up Tilt Table Test (HUTT)

PASIVE TILT TEST (Westminster protocol)



EKG monitoring and BP non-invasive continuous monitoring (finger measurement (Finapres))

Rapid orthostatic hypotension



Classification of a Tilt test results

- **I. Mixed** (*hypotension with bradycardia*)
- **Ila. Cardio-inhibitory without systole** (*HR < 40/min at least 10s*)
- **Ilb. Cardio-inhibitory with asystole** (*asystole > 3 s*)
- **III. Vaso-depressor** (*hypotension with minimal HR fall*)
- **Chronotropic incompetence** (*HR increase < 10%*)
- **Excessive tachycardic reaction** (*HR > 130/min*)

Prevention and therapy of VVS

- **Observation**
- **Avoidance of provocative situations**
- **Restriction of antihypertensive medication**
- **Increased water and salt intake**
- **Head-up tilt sleeping**
- **Abdominal binders**
- **Specific medication**
- **Tilt training**
- **Horizontal position in case of pre-symptoms**
- **Counter pressure manouvre**
- **(RF ablation)**
- **Cardiac stimulation**
- **....**

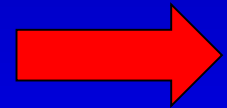
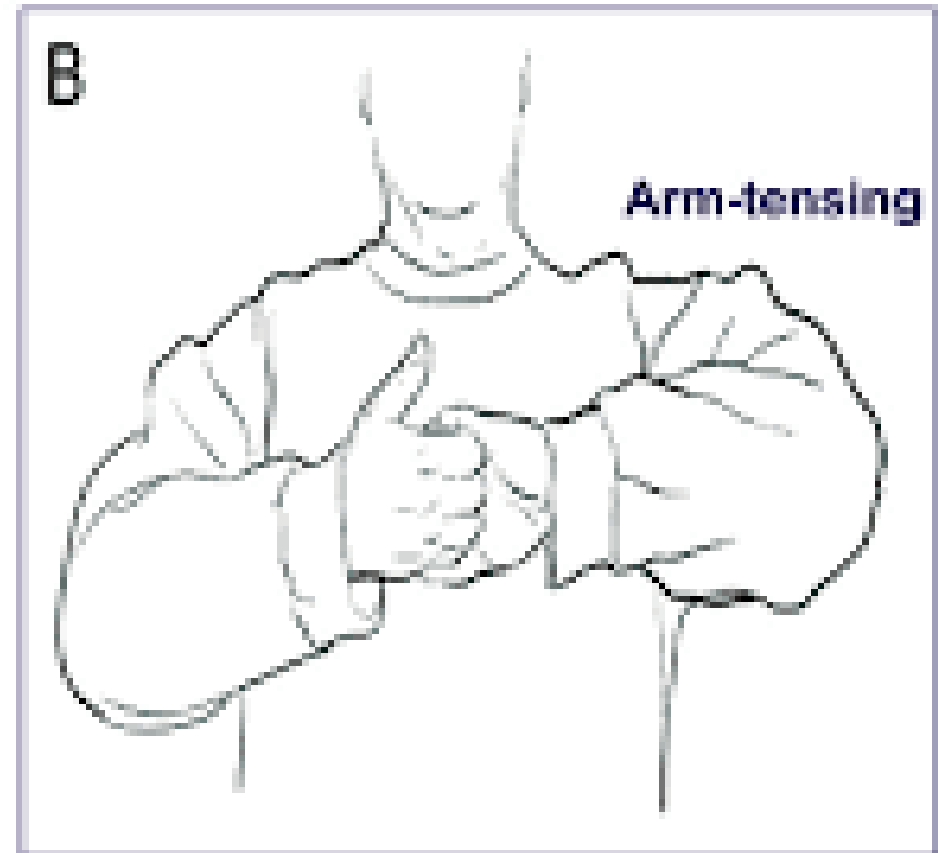
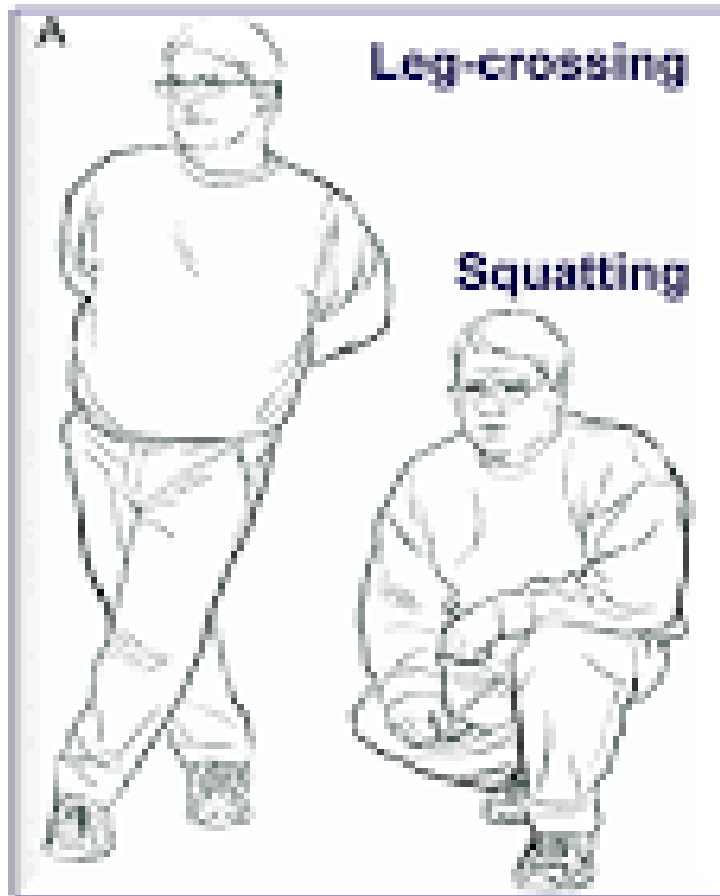
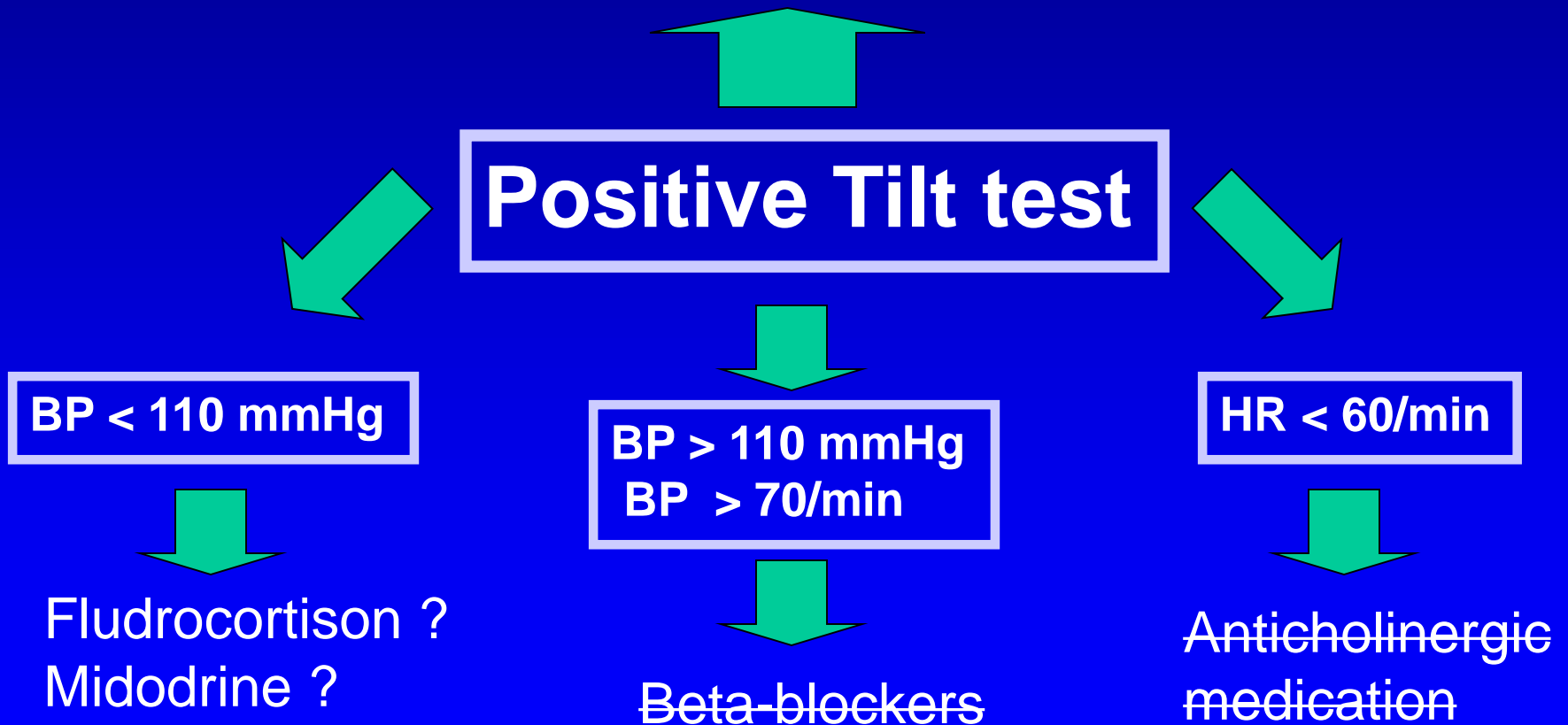


그림 4. Physical counterpressure maneuver

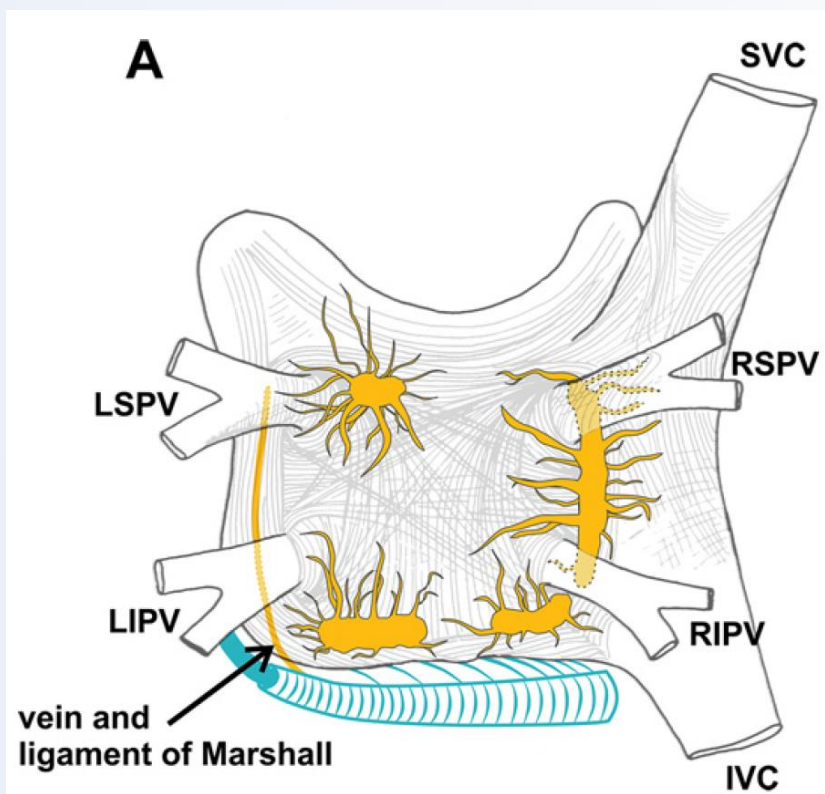


Therapy of vasovagal syncope

Observation, regime, dietary measures,
.....specific medication,



Ganglionic plexus



- VVS conditioned by abnormal nervous regulation of SA or AV node.
- RF ablation/intervention of epicardial ganglionic plexus may influence these autonomic regulations.

**Sufficient answer of SN to atropin is necessary.
(\uparrow HR after atropin 2 mg \geq 90/min. and/or \geq 25%).**

Tilt training ??

Outpatient - once a day tilting to 60° until the induction of syncope (limit 90 minutes).

6 days in a row

At home under the supervision of a person who participated in outpatient training

2 times a day stand with a backrest against the wall with heels 20 cm from the wall for 15 - 30 minutes.

Cardio stimulation:

- Indicated in case of carotid sinus sensitivity with recurrent syncope
(Class I. indication)
- Recurrent syncope (>5 per year) or syncope with injury + documented cardio-inhibition on Tilt testu.
(Class IIb. indication)



Cardiac syncope

- Supine or exercise
- Preceded by palpitation or chest pain
- Presence of structural heart disease
- Family history of sudden death (Long QT sy)

When to hospitalize a patient ?

- Known heart disease
- ECG suspected of arrhythmic syncope
- Syncope during exercise
- Syncope causing severe injury
- Family history of sudden death
- (Palpitation in supine preceding syncope)

Coma

(prolonged unconsciousness)

Pathophysiological mechanisms of unconsciousness due to internal diseases

- Lack of brain perfusion with oxygenated blood with appropriate perfusion BP
- Toxic reasons:
 - Chemical (intoxication, metabolic disorders, mineral disturbances,)
 - Physical disturbances (osmolarity, pH, high/low temperature)

Other pathophysiological mechanisms of unconsciousness

- CNS trauma, oedema, tumors
- Epilepsy
-

Organs or systems disorders which could be the reason of unconsciousness

- **CNS**
- **Cardiovascular system/circulatory disorders**
- **Metabolic/endocrine disorders**
- **GIT**
- **Respiratory diseases**
- **(Psychiatric diseases)**

⇒ Extensive differential diagnosis

Circulatory mechanisms

- **Insufficient brain perfusion with oxygenated blood with appropriate perfusion pressure**
 - Pump failure
 - Obstruction to flow
 - Insufficiency of circulatory volume
 - Pulmonary congestion
 - Short circuit
- **Arterial hypertension** - brain edema

Circulatory reasons of long term unconsciousness

- Heart pump failure (+ pulmonary congestion):
 - a) acute heart failure: AMI, arrhythmias (brady/tachy)
 - b) chronic HF
 - **Obstruction to flow:** cerebral atherosclerosis/ embolism, pulmonary embolism, cardiac tamponade, aortic dissection
-
- **Low circulatory volume** (next)

Reasons of low circulatory volume

- Bleeding: trauma, GIT, coagulopathy
- Dehydration
- Vasodilatation (relative insufficiency of circulatory volume) :
 - Medication
 - Intoxication
 - Septic shock
 - Allergic reaction

Respiratory diseases

↓ O₂, ↑ CO₂

- Obstruction of upper breathing ways: laryngospasm/aspiration/tumor/struma
- Pneumonia
- Pneumothorax
- COPD, bronchial asthma
- (Hypercapnia induced by oxygen treatment in severe global respiratory insufficiency)

Metabolic diseases

- Hypoglycaemia - hypoglycaemic coma
- Hyperglycaemia - hyperglycaemic coma
- Uraemia - renal failure (acidosis)
- Hepatic coma
- Hypothyreosis - myxoedematous coma

Intoxication

- Medication
- Drug abuse
- Chemicals
- CO
- Plants (mushroom)
- Animal poisons
-
- Voluntary - suicide
- Involuntary

Disorders of CNS

- Stroke
- Bleeding: intraparenchymal, subdural, epidural, purpura
- Tumours
- Epilepsy
- Contusion/trauma
- Neuroinfection

**How to start differential
diagnosis?**

Exclude first of all diseases:

1. With the biggest risk of time delay
2. Most frequent
3. With easy diagnosis

**The most emergent reason
of unconsciousness ?**

The most emergent reason of unconsciousness ?

- Circulatory disorders
- Respiratory diseases
- Intoxication
- Trauma

Most frequent reasons of unconsciousness -

- different with respect to age

- **Circulatory disorders**
- **Infections**
- **Intoxication**
- **Metabolic diseases**

Examinations:

- Medical history
- Physical examination (including BP)
- Laboratory tests (including toxicological exam)
- ECG
- Chest, head x-ray
- Echocardiography
- Neurological examination
- Eye examination
- Head CT/NMR

Medical history

- **Previous diseases** (DM, arrhythmia, MI, ..)
- **Allergies**
- **Chronic medication**
- **Similar status (epilepsy)**
- **Onset of event, circumstances, ...**
- **Frequency** (in case of recurrence)

Physical examination

- **Confirmation of unconsciousness**
- **Vital functions**

- **Skin (pale, cyanosis, icterus), moisture, temperature, hydration**
- **Head, neck.**
- **Chest (arrhythmia, valve disease, pneumonia, pneumothorax, congestion)**
- **Abdominal exam (hepatomegaly, bleeding,..)**
- **Extremities**
- **Per rectum (exclusion of bleeding)**
- **Neurological orientation**

Diagnosis/confirmation of unconsciousness

- Loud addressing
- Shaking his/her shoulders
- (Pinch of ear)
- Vital functions
- Glasgow coma scale

Laboratory examinations

- Blood glucose level
- Creatinine, urea, minerals
- Liver enzymes
- Markers of myocardial injury
- Toxicology
- Acid-base balance (Astrup), blood gases

Therapeutical tests

- **Glucose i.v.**
- **Antidote**
 - Naloxon – opioids
 - Flumazenil (Anexate) - benzodiazepins

Management/treatment

- **Securing of vital functions**
- **Specific approaches with respect to a specific disease**