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SPEECH TESTING – see p. 26 >>

SPINE TESTING – see p. 45 >>

SI JOINT TESTING – see p. OJ290 >>

Three main functions of nervous system: ...........................................

1. Sensory

2. Motor

3. Mental

Objective examination is started during history taking – by observing patient and listening to his / her
Aging alone causes symmetrical changes!

**EQUIPMENT FOR NEUROLOGICAL EXAMINATION:**

<table>
<thead>
<tr>
<th>INSTRUMENT</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible steel measuring tape</td>
<td>measuring body circumferences, length of extremities, size of skin lesions, etc.</td>
</tr>
<tr>
<td>Transparent mm ruler</td>
<td>measuring papillary size, size of skin lesions, distances on subphrenic films</td>
</tr>
<tr>
<td>Stethoscope</td>
<td>auscultation for bruits (neck vessels, eyes, cranium)</td>
</tr>
<tr>
<td>Blood pressure cuff</td>
<td>checking blood pressure and orthostatic hypotension</td>
</tr>
<tr>
<td>Flashlight with rubber adapter</td>
<td>checking papillary reflexes, inspection of pharynx, palmar examination of infant head</td>
</tr>
<tr>
<td>Tongue blades (three per patient)</td>
<td>1. for depressing tongue</td>
</tr>
<tr>
<td></td>
<td>2. for eliciting gag reflex</td>
</tr>
<tr>
<td></td>
<td>3. (trikuspid) – for eliciting abdominal and plantar reflexes</td>
</tr>
<tr>
<td>Opacified vial of coffee</td>
<td>testing smell</td>
</tr>
<tr>
<td>Transparent mm ruler</td>
<td>measuring pupillary size, size of skin lesions, distances on radiographic films</td>
</tr>
<tr>
<td>Stethoscope</td>
<td>auscultation for bruits (neck vessels, eyes, cranium)</td>
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</tr>
<tr>
<td>Opacified vial of salt and sugar</td>
<td>testing taste</td>
</tr>
<tr>
<td>Ophthalmoscope</td>
<td>funduscopy; examination of ocular media and skin surface for beads of sweat</td>
</tr>
<tr>
<td>Tuning fork (256 Hz recommended)</td>
<td>testing vibratory sensation and hearing</td>
</tr>
<tr>
<td>Otoscope</td>
<td>examination of auditory canal and drum</td>
</tr>
<tr>
<td>Cotton wisp</td>
<td>one end rolled for eliciting corneal reflex; other loose for testing light touch</td>
</tr>
<tr>
<td>Disposable straight pins</td>
<td>testing hot and cold discrimination</td>
</tr>
<tr>
<td>Penny, nickel, dime, paper clip, key</td>
<td>testing stereognosis</td>
</tr>
<tr>
<td>Reflex hammer</td>
<td>eliciting muscle stretch reflexes; muscle percussion for myotonia</td>
</tr>
</tbody>
</table>

**BABINSKII/RABINER Hammer:**

**TAYLOR Hammer:**

**TRÖMNER Hammer:**

**RIESTER DEJERINE Hammer:**

**COMPLAINTS (QUERIMONIA):**

1. Loss of consciousness (fainting, blackouts)
2. Sensory (exact location, symmetry):
   1. 1) pains (incl. headache)
   2. 2) numbness (anesthesia)
   3. 3) tingling (paresthesias)
3. Motor:
   1. 1) muscle weakness (local, general) – what patientas gali daryti ir ko negali (e.g. is this weakness for brushing the hair or opening a twist-top bottle?)
   2. 2) involuntary movements (incl. tremors)
   3. 3) fallings (all adults who fall without ready explanation should be evaluated neurologically)
1. Temporal course of illness:
1) rapid onset (seconds × minutes)
   a) VASCULAR EVENT ("negative" symptoms - sensory or motor), transient remission or regression indicates that process is likely ischemic and not hemorrhagic.
   b) SEIZURE ("positive" symptoms - sensory or motor).
   c) MIGRAINE.
2) subacute onset (hours × days)
   a) DEMYELINATING process
   b) INFECTIONS process.
3) chronic course (over years)
   a) MULTIPLE SCLEROSIS (remissions and exacerbations involving different levels of neuroaxis).
   b) NEUROGENIC disorder (slowly progressive symptoms without remissions).

2. Previous nervous system disorders:
1) disorders (meningitis, encephalitis, seizures)
2) trauma
3) surgeries

3. Previous / current systemic illnesses (esp. MALIGNANCIES – whether chemotherapy or radiotherapy was given?, metastases, paraneoplastic syndrome).

If patient is known to have carcinoma, metastatic disease is assumed to be basis of neurologic symptoms until proved otherwise!

4. Vartojami ir vartoti medications (both prescribed, OTC, and illicit); e.g.: digitalis → yellow vision; excessive vitamin A → pseudotumor cerebri; excessive pyridoxine → peripheral neuropathy. amitriptyline → diziness, weakness-exacerbation in disorders of neuromuscular transmission. alcohol – most common neurotoxin!

5. Exposure to toxins (environmental or industrial).

6. Stroke risk factors:
1) TIA
2) diabetes
3) hypertension
4) smoking
5) c/v disorders (esp. atrial fibrillation)
6) anticoagulants, antiaggregants
7) oral contraceptives

7. Family history - existence of similar symptoms in other family members, possibility of parental consanguinity,

- corroborate history by others (surrogate historians - family, friends, observers, paramedics) to expand patient's description.

- in cases of memory loss, personality change, drug & alcohol abuse, physical abuse, loss of consciousness!

- summarize history for patient - effective way to ensure that all details were covered sufficiently; patient (or surrogate historian – family member, caregiver) may correct any historical misinformation at this time.

- end by asking patient what he / she thinks is wrong - allows physician to evaluate patient’s concerns about and insight into condition (some patients have specific diagnosis in mind that spurs them to seek medical attention).

GENERAL EXAMINATION

1) pulse & BP
2) breathing pattern (diaphragmatic vs. eupneic; tarpokaukalingas raumenų paralyžius)

HEAD
1. Face - bendra išraiška, veido detalės, plaukai.
2. Skull shape, symmetry, malformations - usual circumference should be measured (normally 55 ± 5 cm in adults); routinely – only children < 2 yrs.
   - palpable lesions under scalp.
3. Distention of scalp veins - signs of increasing ICP.
4. Jei skundžiasi galvos skausmai - perkonsito sinus ir processus mastoidius; sinusus bandytis ir transilluminoji.
1. Alignment & deformities
2. Limitation of motion (jadiusis blokas - segmentas ir krystis).
3. Percussion (intraspinal lesions frequently produce localized percussion tenderness).
4. Palpation:
   1) processus spinosi
   2) paravertebral (per širdį nuo vidurio linijos, tarp dvių proc. spinosi - stuburo sąnarėliai)
   3) grynas, banchialai et hambalii.
   - pressure over nerve roots may produce pain.
   - generalized paraspinal tenderness may represent arthritis or myositis, but rarely is associated with intraspinal pathology of surgical significance.

EXTERNAL SIGNS OF TRAUMA
1) skalpos pažeidimai - aptikti ir apčiupti.
2) kaukolės lūžimai (palpuojamos deformacijos, kraujas / likvoriau vojuoj a aušų laisdo, periorbitalinės & retroaurikulinės hematomaus).
3) veido traumos (apžiūrėti ir apčiupimė - tenderness, crepitus, false motion);
   - atliekamas Kernigo simptomas.
   - Demented elderly patients may have false-positive meningeal signs!

MENTINEAL SIGNS
- rutiniškai netiriama (tiriaujama tik įtariant meningitą ar SAH)

1. Nuchal rigidity – passive flexion chin-to-chest:
   - lateral neck movements are preserved (vs. in neck rigidity from musculoskeletal pain).
2. Kernig sign (bent-knee leg raising) - ligonis guli ant nugaros, pasyviai sulenkiama koja stačiu kampu per klubo ir kelio sąnarius (with your left hand placed over medial hamstrings) → use your right hand to extend knee (while hip is maintained in flexion) - skauda, neišsitiesia, other leg flexes.
3. Brudzinski signs - ligonis guli ant nugaros:
   1) neck (s. upper) sign - pasyviai lenkiama chin-to-chest*
   2) middle sign - spaudžiamas viršutinis simfizės kraštas*
   3) contralateral (s. lower) sign - atliekamas Kernigo simptomas.
   - esant meninginiam dirginimui, kojos refleksiškai susilenkia.
   - **esant meninginiam dirginimui, priešinga koja refleksiškai susilenkia.

SENSORY EXAMINATION
- requires cooperation and concentration by patient - provide brief introduction to purpose and methods of each sensory test.

LESION LOCALIZATION GUIDE
- requires cooperation and concentration by patient - provide brief introduction to purpose and methods of each sensory test.

also see p. Exam5 >>

further see p. TrH1 >>
further see p. TrH5 >>
further see p. TrH25 >>

further see p. TrS5 >>

N.B. kol neekskliuduota ūmi nugaros trauma - ligonio nelankysti!!!

further see p. TrH >>

further see p. TrH5 >>

further see p. TrH5 >>

further see p. TrH25 >>

further see p. TrH25 >>

further see p. TrH25 >>

further see p. TrH25 >>
in obtunded patient, sensory examination is reduced to observing briskness of defensive movements in response to noxious stimulus. In alert but uncooperative patient, evaluate proprioception by noting patient's movements requiring balance and precision; cutaneous sensation may be unexaminable!

- sensory testing readily fatigues patient (→ unreliable, inconsistent results) – repeated testing at another time is often required to confirm abnormalities.

- ligonsauska yra užkirstęs
- tuo pačiu aplibrināšana ir visā jūda vaļā – NEUROCUTANEOUS STIGMA (e.g. café au lait spots, cutaneous angiomas, adenoma sebaeum).

- vary pace of testing so that patient does not merely respond to your repetitive rhythm.

Tiriant DERMATOMUS, jūdama taip, kad ligonis galėtų palyginti gretimus dermatomus:

- galvutė - cefalhartis,
- liemenų – up and down anteriorly or posteriorly (usually, some physiological overlap occurs at sensory level when examiner first moves rostrally then caudally).

N.B. nepamiršk kartu iškelti unikalių stebuklių (supplied by upper cervical dorsal root) ir tarpvietis (gal būti vienintelis požymis, kad nugaras smegmą transekciona nepilna).

Skinnaus (jei pacientas neturi sensorinių nusiskundimų):

1) light touch over arms & legs
2) pain & vibration in hands & feet
3) stereognosis

1. Light touch (esthesia) with fine cotton wisp – touch skin lightly (avoid any pressure on subcutaneous tissue) - ask patient to respond whenever you touch his skin.

“Respond whenever you feel a touch”

- thresholds are increased in elderly.
- quantitative assessment of light touch threshold: SEMMES-WESTMINSTER nylon monofilaments (standardized thickness creates specific force at point which monofilament bends after contact with skin).

2. Pain (tactile)

1) superficial pain - adulate i.e. buka daiktui – ask patient “Sharp or dull?”

N.B. skausmą testuoja tik adatėlė, o bukas daiktas

*patient with absence of position sense will have 50% error rate (answers that are consistently > 50% in error should be viewed with skepticism).

2) deep pain (ask patient to report as soon as he feels discomfort) - squeeze muscle bellies (e.g. calf, biceps) or apply pressure to finger or toe nail beds.

Do not apply pressure with instrument, e.g. pen!

3. Temperature (nereikia, jei skausminiai jutimai normalūs)

- it is satisfactory if patient can identify as warm or cool (flat).

* - between 28 and 32°C; most individuals can distinguish temperature differences in 1°C steps.

- cooler: 28°C; most individuals can distinguish temperature differences in 1°C steps.

28-32°C.

- ask patient to report as soon as he feels discomfort (he feels discomfort) – squeeze muscle bellies (e.g. calf, biceps) or apply pressure to finger or toe nail beds.

3. Vibration

128-256 Hz tuning fork is placed firmly over joint by placing his finger under patient's joint.

- ask patient what he feels (if uncertain whether patient feels pressure or vibration, ask him to tell you)

- it is satisfactory if patient can identify as warm that is 35-36°C and as cool one that is 28-32°C.

- ask patient what he feels (if uncertain whether patient feels pressure or vibration, ask him to tell you)

* - between 28 and 32°C; most individuals can distinguish temperature differences in 1°C steps.

4. Vibration

128-256 Hz tuning fork is placed firmly over distal IP joints of finger and toe (examiner supports joint by placing his finger under patient's joint).

- ask patient what he feels (if uncertain whether patient feels pressure or vibration, ask him to tell you)

* - ask patient to report as soon as he feels discomfort (he feels discomfort) – squeeze muscle bellies (e.g. calf, biceps) or apply pressure to finger or toe nail beds.

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Do not apply pressure with instrument, e.g. pen!

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* - ask patient to report as soon as he feels discomfort (he feels discomfort) – squeeze muscle bellies (e.g. calf, biceps) or apply pressure to finger or toe nail beds.

5. Proprioception (position sense)

1) locate limb in space

2) basotytų rankų ir kojų: I and IV interphalangeal joints (avoid friction against neighboring fingers):

- before testing, while eyes are open, demonstrate: “This is up, and this is down.

* - ask patient to close eyes and identify directions in random sequence of small movements (e.g. up, down, up, down).

* - ask patient to close eyes and identify directions in random sequence of small movements (e.g. up, down, up, down).

- close your eyes and tell me which direction I am moving your big toe.

* - close your eyes and tell me which direction I am moving your big toe.

- close your eyes and tell me which direction I am moving your big toe.

* - close your eyes and tell me which direction I am moving your big toe.

7) Romberg test

- normal threshold is 5-10° in interphalangeal joint of index finger, 17° at shoulder.

* - patient with absence of position sense will have 50% error rate (answers that are consistently > 50% in error should be viewed with skepticism).

3) Romberg test

- normal threshold is 5-10° in interphalangeal joint of index finger, 17° at shoulder.

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3) Romberg test

- normal threshold is 5-10° in interphalangeal joint of index finger, 17° at shoulder.

* - patient with absence of position sense will have 50% error rate (answers that are consistently > 50% in error should be viewed with skepticism).
6. Discrimination (all other types of primary sensation must be intact; patient’s eyes closed) – testing sensory cortex; always compare symmetric sites!!!

   a) STEREognosis (skrinimų tyrimas) - ligonis palma | delną daiktą (moneta, parkeris, svarželė, etc.) ir vartymas delną į skaičių skaičių; patient can manipulate object freely in hand but should not use contralateral hand at same time).
   • normally, familiar objects can be named within 5 seconds of contact.
   • N.B. asking to distinguish “heads” from “tail” on coin is sensitive test of stereognosis!

b) GRAPHHESTHESIA, s. NUMBER IDENTIFICATION (kai pakenkta motorika ir negali atlikti stereognosiu) - ant odos būkite daiktą (šibrėžytą skaičių (numbers should be drawn large enough to occupy most of palm).
   • test areas: palm, anterior forearm, thigh, lower leg.
   • clearest figures for interpretation are 4, 5, most difficult - 6, 9, 3.
   • normally, familiar objects can be named within 5 seconds of contact.
   • N.B. asking to distinguish “heads” from “tail” on coin is sensitive test of stereognosis!
   • normally, familiar objects can be named within 5 seconds of contact.

   c) TOPESTHESIA, s. POINT LOCALIZATION - paliesti odą, ligonis atsimerkia ir pirštu parodo (ar pasako), kur tai buvo padaryta.

   d) BARESTHESIA - place two objections of different weight in patient's hand and have him identify which is heavier.

   e) TWO-POINT DISCRIMINATION - using sides of two pins touch finger pad in two places simultaneously (alternate irregularly with one-point touch) – find minimal distance which patient can discriminate one from two points (norma 2-3 mm).

   f) EXTINCTION (testing for HEMINEGLECT) – simultaneously stimulate symmetrical areas on both body sides – ask patient where he feels touch (normally should feel both stimuli; parietal cortex lesion – only one stimulus may be recognized).

   N.B. if affected side is stimulated in isolation, it is recognized normally!

   e.g. touch back of each hands in turn and ask which has been touched; now touch both hands simultaneously and ask whether left, right or both sides were touched.

Areas that normally are less sensitive to touch:
1) antecubital fossa, supraclavicular fossa, neck.
2) areas of thicker skin (e.g. elbow, regions covered by calluses).

Radus jutimo sutrikimus, būtina tiksliai surasti ribas nuo pakitusio taško judant proksimalyn.
   • taisyklė – judama nuo patologinės zonos link normalios (people are much more sensitive to appearance of sensation than to its disappearance).
   • level of spinal lesion is more likely to be indicated by cutaneous sensory loss than by motor signs!
   • dermatomal vs. peripheral nerve pattern – by mapping altered sensation areas:

Fasc. gracilis et cuneatus – vibracija, propriocepcija, taktiliniai (diskriminaciniai).
Tr. spinothalamicus – t-ra, pain, taktiliniai (nediskriminaciniai).
Sensorinė žievė – diskriminacija.

Lhermitte sign (spinal posterior column demyelination): neck flexion (stretches and irritates damaged fibers in dorsal columns of cervical spine) ➔ electric-shock-like feeling that travels down spine or into extremities.

SPURLING test (cervical root disease): patient is seated, extended neck is rotated and laterally flexed to side of symptoms ➔ careful pressure applied to top of head in downward direction ➔ exacerbation of pain / numbness in upper extremity.
Axial loading test (cervical disk pathology): patient standing; examiner pushes down on patient’s head → neck pain:

**CUTANEOUS INNERVATION**

**DERMATOMES**

*see p. also PN1 >> (radiculopathy)*

C1 – no such dermatome!

- interaural line – border between C2 and n. ophthalmicus
- C2 – occiput
- C3 – neck, thyroid cartilage
- C4 – clavicle, suprasternal notch (C3-4 – cape area)
- C5 – below clavicle
- C6 – 1st-2nd fingers
- C7 – 3rd finger
- C8 – 4-5th fingers

C4(5) abuts on T2(1)

- T2 – axilla
- T4 – nipple
- T10 – umbilicus

L1 – inguinal (femoral pulse)
- L2 – medial thigh
- L3 – medial-anterior knee
- L5 – big toe

S1 – little toe, lateral heel
- S2 – popliteal fossa
- S2-Cx converge on coccyx (bull’s eye) not anus!

N.B. as one passes from one skin area to adjacent area supplied by much higher spinal segment*, it is normal for patient to sense sudden increase in stimulus at point of segmental border.

*e.g. on chest where dermatomes C4 and T2 abut.
Cutaneous Nerve Distributions (upper limb):

- Upper lateral brachial cutaneous (axillary)
- Posterior brachial cutaneous (radial) & lower lateral brachial cutaneous
- Lateral antebrachial cutaneous (musculocutaneous)
- Median (ulnar)

Cutaneous Nerve Distributions (lower limb):

- Lateral femoral cutaneous n.
- Obturator n.
- Femoral n., anterior cutaneous branches
- Saphenous n.
- Tibial n., medial calcaneal branches
- Sural n.
- Deep peroneal n.
- Tibial n., lateral calcaneal branches
- Sural n.
- Superficial peroneal n.

Anterior Posterior
NEUROLOGIC EXAMINATION

Ophthalmic n.
Mandibular n.
Great auricular n.
Transverse colli n.
Supraclavicular nn.
Intercostal nn.
1. Ant. cutaneous rami
2. Lat. cutaneous rami
Axillary n.
Med. brachial cutaneous and intercostobrachial nn.
Med antibrachial cutaneous n.
Lat. antibrachial cutaneous n.
Radial n.
Median n.
Ulnar n.
Median n.
Volar digital nn.
Abductor pollicis brevis n.
Ant. thoracic cutaneous n.
Saphenous n.
Lat. sural cutaneous n.
Superficial peroneal n.
Sural n.
Deep peroneal n.
Medial plantar n.

Greater occipital n.
Lesser occipital n.
Great auricular n.
Transverse colli n.
Cutaneous branches of dorsal rami of spinal nn.
Suprascapular n.
Lat. cutaneous branches of intercostal n.
Axillary n.
Post. brachial cutaneous n.
Med. brachial cutaneous and intercostobrachial nn.
Post. antibrachial cutaneous n.
Lat. antibrachial cutaneous n.
Med antibrachial cutaneous n.
Ulnar n.
Radial n.
Median n.
Volar digital nn.
Abductor pollicis brevis n.
Ant. thoracic cutaneous n.
Saphenous n.
Lat. sural cutaneous n.
Sural n.
Saphenous n.
Calcaneal nn.
Saphenous n.
Planter branches of tibial n.
DETECTION OF SENSORY MALINGERING

N.B. it also applies to nonorganic sensory disorders (e.g. conversion reaction in hysteria).

**CLUES:**
1. zone hyperesthetic for one sensation and anesthetic for another.
2. anesthesia with sharp (≠ demarcation) that does not fit any peripheral nerve or dermatome in hands or feet (“glove and stocking” with very sharp line of demarcation at joint lines).
3. anesthesia exactly to midline (esp. midline change for vibration sense over bony areas).
4. absolute loss of all cutaneous sensation.
5. loss of hearing and vision on same side as skin anesthesia (pansensory loss).
6. hyperesthesia that resolves with mild distraction.
7. marked variation with repeated examination.
8. preserved function despite dramatic sensory findings (no clumsiness or ataxia, and gait is unaffected).

**DIAGNOSTIC METHODS** (patient eyes closed!!!):
1. Ask patient to respond "yes" when he believes that stimulus has been applied and "no" when he does not feel that stimulus was applied - must be done quickly and only once! malingering patient may be identified such that timing of answer “no” exactly coincides with each stimulus contact.
2. Mark boundaries of alleged anesthetic area with pen; when testing is repeated at short intervals alleged area will be found to vary considerably.
3. Zig-zag test - border of hyperesthetic or anesthetic area is marked; start again at periphery of limb and work upward with stimulus in zig-zag fashion. in malingering patient, border may shift downward (and repeated tests will continue to bring it lower). patient is led to feel greater distance has been covered in straight line reference.
4. Draw figures of different shapes on patient's skin; figures are drawn such that part of outline falls within alleged anesthetic area and part without. malingering patient may correctly identify figure even when critical portion of figure necessary for identification is drawn within alleged anesthetic area.
5. Cross patient's hands & fingers behind back and then proceed to test sensibility. in malingering patient observer may see bending of alleged insensible finger as it is touched or hesitation in responding to stimulus.
6. Withdrawal from pinprick is one of least useful modalities (because some patients may withstand great pain without withdrawal!).

MOTOR EXAMINATION

It is axiomatic that patients typically have motor signs before* motor symptoms** and, conversely, sensory symptoms before sensory signs.

*patients with even severe weakness may not report symptoms of weakness!
**usually reported by patient in terms of loss of specific functions (i.e. difficulties with specific tasks).

N.B. symptom of "weakness" without findings of weakness on examination is not usually result of neuromuscular disease but can be sign of neurologic disease outside motor unit or more commonly symptom of disease outside nervous system altogether!

N.B. pain presence may invalidate motor examination!

If it is not possible to perform formal motor testing (patient is not cooperative or is comatose):

1) motor movement should be elicited by application of noxious stimuli - record any movement of extremities (kurioms galūnėmis ginasi nuo skausmo, ant kurio šono spontaniškai gulasi ir pan.). N.B. voluntary purposeful movement must be distinguished from abnormal motor posturing (decorticate, decerebrate).
2) check for muscle tone letting limb passively to fall down.

For details see p. 111 (motor asymmetry).
1. SOMATOMYPE (BODY GESTALT), MUSCLE BULK

- patient in state of sufficient undress.
- skinning – pelvic & shoulder girdles, hands (thenar, hypotenar, spaces between metacarpals).
  - upper extremities should be inspected in both pronated and supinated positions (differences in extensor and flexor compartments of forearm).
  - lower extremities should be observed from front and back while patient is standing.
- if asymmetry is apparent → bulk of muscle groups is measured objectively by measuring girth and comparing sides:
  - point (at which circumference is to be measured) is marked with ballpoint pen, usually at point of greatest estimated girth.
  - to find same site on opposite limb, distance to closest bony landmark is measured, and that measurement is used on opposite limb.
  - muscle bulk is greater in dominant limb.
- normal difference between sides: ≤ 1.0 cm in leg & thigh, ≤ 0.5 cm in forearm & arm.
- in most cases, significant asymmetry indicates ATROPHY (in some cases, it may be unusual HYPERTROPHY or PSEUDOHYPERTROPHY).

2. ABNORMAL MOTOR ACTIVITY

**FASCICULATIONS**
- observe relaxed limbs that are illuminated from behind.
- place to look for fasciculations depends on subcutaneous tissue amount: thin elderly men - shoulder girdle and pectoral muscles are often good. more adipose people - first dorsal interosseous muscle of hand.
- fasciculations are best observed in relaxed tongue (no subcutaneous tissue separates muscular layer from epithelium).
- forcible contraction or muscle percussion may increase frequency of fasciculations.

N.B. fasciculations are commonly experienced as benign phenomenon in absence of any disorder! Motor neuron disease never starts with fasciculations alone.

**DYKINESIAS** (tremor, chorea, athetosis, dystonia, etc.) - primary testing conditions:
1) REST - sitting quietly in comfortable position (extremities fully relaxed and supported so that patients are not holding posture); when engaged in conversation, most normal individuals have spontaneous hand gestures, often cross one leg over other, and smile when chatting.
N.B. sitting position is one of rest for any disorder! Motor neuron disease never starts with fasciculations alone!
2) STATIC POSTURE - observe postural tremor, chorea, myoclonic jerks, dystonic tremor (patient's own compensatory movement to overcome dystonia - therefore tremor is maximized in position that opposes natural dystonic contraction).
- “flapping tremor” (asterixis) (benign phenomenon in absence of any disorder!) may be apparent only when arms are outstretched with hands dorsiflexed.

3) VOLUNTARY ACTIVITY
- finger tapping: slow and cramped in hypokinesia; sloppy and overridden with additional movements in chorea; may precipitate spasms of contorted hand posture in dystonic.
- handwriting: bradykinesia causes slow and cramped parkinsonian script (micrographia); action tremor causes large, tremulous signature; dystonia induces irregular script and often patient will need to adjust pen several times because of painful spasms or involuntary dytonic movements.
- finger-to-nose task helps differentiate tremors. speech - to detect dysarthria, hypophonia, language disorders; talking is common motor act that induces overflow dystonic movements elsewhere in body.
- Movement disorders of all types can affect production and clarity of speech!!

4) WALKING

3. MUSCLE TONE

- ask patient to relax completely (it is useful to distract patients attention; room must be warm!).
- patients vary in ABILITY TO RELAX.
  - it is easier to relax lower extremities in sitting position, whereas upper limbs can be examined in either sitting or lying position.
  - mildly demented elderly people tend to voluntarily help move limb in desired direction.
-- pain or bone/joint abnormalities may cause resistance to passive movement.
-- in completely relaxed patient, no resistance should be felt at wrist and elbow, and minimal resistance at shoulder, knee, and ankle.

N.B. limitation of joint range of motion or painless swelling of joints is often sign of unsuspected neurologic lesion!

- move each joint through full range of flexion and extension -- first slowly, then quickly
- compare sides! (minimal but pathological increase in tone may initially be considered normal until one compares it with normal side)

UPPER EXTREMITIES:
- hold patient's hand as if shaking hands, using your other hand to support patient's elbow -- rotate forearm, flex and extend wrist, elbow and shoulder
- vary speed and direction of movement!
- flexion of wrist can be compared by noting distance thumb can be brought to flexor aspect of forearm.
- shake forearm and observe floppiness of movements at wrist. with arms raised overhead, compare degree of flexion or limpness of wrist on each side.

LOWER EXTREMITIES:
1) begin by rolling or rotating leg from side to side:
2) briskly lift knee into flexed position, then extend:
3) flex-extend ankle:

- place your hands behind thighs and rapidly raise them after instructing patient to let leg flop:
  a) normal tone - heel may come off bed slightly and transiently and then drag along sheet; heel drags along table surface for variable distance before rising.
  b) heel of flaccid leg will be dragged across bed from very beginning.
  c) increased tone - immediate heel lift off surface and never fall back to bed.

TONE:
- ADHYSTOMA (A. FLACCIDITY)
  a) SPASTICITY
  b) RIGIDITY
  c) PARATONIA / GEGENHALTEN

4. MUSCLE STRENGTH
Power may be examined in variety of ways:
A. Direct testing - patient is asked to push or pull in specified direction against resistance of physician - strength in each muscle group is graded 0-5 by scale developed by Medical Research Council.
B. Observation of task performance - useful in detecting mild, asymmetric weakness.
C. Functional testing with quantitation (e.g. counting number of times person can perform deep-knee bend or timing length of time arms can be held abducted to 90 degrees) - provides reproducible data for assessment of changes over time.

RAUMENS JEGOS SKALE (Medical Research Council rating of muscle strength) - maximum force generated by effort to move involved body area:
- 0 - no contraction (paralysis)
- 1 - palpable muscle contraction, no limb movement (paresis)
- 2 - active movement in gravity-neutral plane (paresis)
- 3 - active movement against gravity (paresis)
- 4 - active movement against gravity and resistance (paresis)
- 5 - normal power

ATIONS: ARM (STRENGTH):AVI >>
- triceps, biceps
- wrist flexion, extension
- hand grip (duok suspausti savo II ir III pirštus sudėtus vieną ant kito; paprastai tiriame abit puses simultaniškai), finger abduction & extension;
2) **SHOULDER GIRDLE** - priešinamės abdukcijai; šaltai spaudžiame abdukuotą žastą prie liemens (scapula alata - m. serratus ant. sīlpnumas), priešinamęs addukcijai.

3) **excursions of RIB CAGE**.

4) **ABDOMINAL MUSCLES** – have supine patient do sit-up or just raise head (watch for umbilical migration upward – Lord BEEVOR sign – paralyzed lower abdominal muscles, but intact upper muscles).

5) **LOWER EXTREMITIES** – test hip flexors, abductors, adductors, knee flexors, foot inverters and everters:

Knee extensors are tested by deep knee bend, plantar flexors – by toe walking, foot dorsiflexors – by heel walking.

6) **tests to detect mild paresis**:

- **Upper BARRÉ sign** – patient is asked to extend arms in fully supinated position while keeping eyes closed; mildly parietic arm gradually becomes pronated and sometimes flexed and drifts downward (“pronator drift”).

- **Lower BARRÉ sign** – patient is placed in prone position with limbs flexed at knees; paretic limb is unable to maintain flexed position and leg extends.

- **Digiti quinti minimi sign** (hyperabduction of outstretched fifth finger on paretic side).

- **Forearm rotator sign** - patient rotates forearms around each other; paretic arm tends to stay fixed while good arm rotates around it.

7) **objective measurements** - DINAMOMETRIA (e.g. handgrip ergometer or by having patient squeeze inflated BP cuff).

<table>
<thead>
<tr>
<th>Symmetric weakness:</th>
<th>proximal – MYOPATHY*, distal – POLYNEUROPATHY**</th>
</tr>
</thead>
<tbody>
<tr>
<td>exception - Kugelberg-Welander syndrome</td>
<td></td>
</tr>
<tr>
<td>exception – myotonic dystrophy (affects distal limbs)</td>
<td></td>
</tr>
</tbody>
</table>

**NEUROGENIC weakness**: atrophy > weakness; initially affects distal muscle groups; reflexes early absent; fasciculations & sensory changes.

**MYOTIC weakness**: weakness > atrophy; initially affects large proximal muscle groups; reflexes long present (diminish in proportion to weakness degree); no fasciculations & sensory loss.

**NEUROMUSCULAR FUNCTIONAL disorders**: fatigable weakness (initially in extraocular and bulbar muscles); reflexes present; no atrophy; no fasciculations.

**HYSTERICAL weakness** - normal resistance to movement, followed by sudden giving way!

**Hypotonia** may be associated with normal strength or with weakness;

**Thin, wasted muscles** may be weak or have unexpectedly normal strength.
5. FUNCTIONAL MOVEMENTS
- bring out more subtle deficits escaping detection when muscle strength is tested against resistance.
1) walking (gait observation is essential component of neuromuscular examination!!) observe patient in following sequence:
   - SITTING (to make sitting balance more challenging, ask subject to sit on examining table with arms and legs not touching any support surface);
   - ability to ADJUST CHAIR;
   - STANDING unaided (static balance); note distance between feet (indicator of lateral stability)!
   - GAIT at slow then fast pace;
   - passage through NARROW SPACES, DISTRACTIONS, TURNS;
   - TANDEM WALKING heel-to-toe in straight line (tests lateral stability - indicator of cerebellar and vestibular dysfunction);
   - PUSH PATIENT to side and PULL HIM BACKWARD (tests reactive postural responses).
2) hopping in one place on either feet – minus skinning – 
   a) ankle test:
   b) skiatrofo bulsys iki 30.
3) use walking: heel walking, make tight flat – DORSAL MUSCULATURE weakness of foot dorsiflexion (L5 lesion) reduces ability to walk on heels; weakness of gastrocnemius (S1 lesion) diminishes ability to rise on toes.
4) lift arms over head, deep knee bends, rising from deep chair – PROXIMAL MUSCULATURE.
5) rising from supine position (look for Gowers sign –see p. D5 »).

6. FATTIGABILITY
(jei jariama iš atminties) - REPEAT SIMPLE TASKS:
- mirkčioti akimis 100 kartų
- skaitoti balsu iki 30.
- kant judesius per para

7. MYOTONIC MANEUVERS
a) direct muscle percussion:
   - in normal muscle, tap produces such brief contraction and relaxation that it is not seen.
   - in myotonic muscle contraction remains as dimple for few seconds before contraction subsides; in smaller muscle such as tereina, contraction is strong enough to produce adduction of thumb.
- forceful grip. myotonia patient has marked difficulty in relaxing and opening fingers.
- histology in eyelids - ask patient to look upward and then rapidly look down; this produces pronounced lid lag.
- press edge of wooden blade against tongue dorsal surface – deep furrow that disappears slowly.

8. SYNKINESIA (MIRROR MOVEMENTS):
- most often seen in children with cerebral palsy:
  - globalinės (paralyžikai V-M poza, kluzant sveikai);
  - imitacinės (juda nesveikai, kluzant sveikai).
  - koordinacinės (atliekant judesius per para turto suarukus, juda ir kita nesveiki suarukai).
  - ask patient to produce rapid alternating movement of hand; when he does so, it will be mirrored by same movement in opposite hand.

MOTOR SEGMENTS
also see p. P11 >> (radiculopathy)
Reflexes of simetrikumiaus:

- ask patient to relax.
- position limbs properly and symmetrically; muscle (which tendon is tested) must be partially stretched.

REFLEX (SPECIFIC) HAMMER: pointed end - for striking small areas (e.g. finger as it overlies biceps tendon).

flat end - less discomfort for patient (esp. over brachioradialis).

two most commonly used types of hammers:
1) "Queen Square" hammer (developed at National Hospital for Nervous Diseases at Queen Square in London).
2) tomahawk-shaped hammer (used most often by American neurologists).

judensys eina iš rūsio, plaktukas keliauja lanku. stirke tendon briskly.

N.B. reflex response partly depends on stimulus force – so use no more force than you need to provoke definite response.

NORMAL REFLEXES

Localisation in T1-12 area is best accomplished with sensory examination!

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**Reflex Roots**

<table>
<thead>
<tr>
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<tr>
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<td>Triceps</td>
<td>C7-8</td>
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</table>

“going from ankle to triceps, roots are numbered consecutively from 1 to 8”.
Građe reflex activity:

0+ no response (absent even with reinforcement)
1+ low normal (amplitude & velocity ↓; elicited with reinforcement)
2+ normal (amplitude and velocity without reinforcement)
3+ brisker than average (amplitude and/or velocity ↑ with spread to adjacent site)
4+ very brisk (as 3 + duplication of jerk or clonus) (often indicates UMN disease)

Rezultatų užrašymui galima panaudoti figūrėlę (užrašyti skaičiai – norma):

If you use reinforcement, indicate it in record!

Kai refleksai abipus (!) NEŠILAIS ar NEISGAUNAMI, naudok REINFORCEMENT (JENDRASSIK manevu) – isometric contraction of other muscles:
- tariant kojas - ligonis suima rankas už pirštų ir traukia į priešingas puses, o gydytojas tuo metu išgauna reikiamą refleksą;
- tariant rankas - sukanda dantis.
N.B. tėli patient to do maneuver just before you strike tendon!; patient must relax between repeated attempts.

Kai refleksai HIPERAKTYVŪS:
1) suduoti plaktuku ir aplinkui - išplitę reflektorinės zonos
2) check for CLONUS (rhythmic, rapid alternation of muscle contraction and relaxation caused by sudden, passive tendon stretching):
   a) ankle (ligonio koja truputį sulenkta per kelio sąnarį, gydytojas staiga atlieka pėdos dorsiflexiją ir tokioje padėtyje užfiksuoja) - rhythmic oscillations between dorsiflexion and plantar flexion; in developed cases, repetitive plantar flexion of foot can be maintained virtually indefinitely as long as upward pressure is maintained on foot.
   b) patellar (ligonis guli ant nugaros, pirštais suimama girnelė ir staiga patraukiama žemyn, ranka neatitraukiama).
   c) plaštakos (staiga atlenkiama ligonio plaštaka).
N.B. only sustained clonus suggests UMN damage! – generally speaking, however, clonus cannot be obtained at any site in normal individual (occasionally, 1-2 beats of clonus can be obtained at ankle in normal individuals with naturally brisk reflexes).
- severity of clonus parallels severity of spasticity & hyperreflexia.

A. MUSCLE STRETCH (DEEP TENDON) REFLEXES

1. Brice n. musculocutaneus C6 - patientas guli arba sėdi, alkūnė 120° kampu, delnas žemyn; gydytojas tvirtai uždeda nykštį ant bicepso sausgyslės ir per jį suduoda plaktuku (→ sulinksta alkūnė).
2. Triceps n. radialis C5-6 - paciente guli arba sėdi, alkūnė 90° kampu, dilbis skersai krūtinės, delnas žiūri žemyn; laikant ligoniui už riešo plaktuku aukščiau alkūnės suduodama per triceps sausgyslę (→ alkūnė išsitiesia);
   - jei pacientas negali atsipalaiduoti, taikomas kitas metodas – žastas abdukuojamas 90° ir liepama kad dilbis laisvai kabočį (if it were "hung up to dry").

3. Patellar (knee) n. femoralis L2-4 - ligonis guli, gydytojas ranka laiko už pakinklių nedaug sulenktus kelius, suduodama per kvadriceps sausgyslę žemiau girnelės (→ susitraukia m. quadriceps femoris);
   - jei pacientas negali atsipalaiduoti, taikomas kitas metodas – laikomas tik tiriamos pusės pakinklis, o ranka remiasi į kitą koją (bet taip sunkiau palyginti abi puses).

4. Achilles (ankle) n. tibialis S1-2 - prilaikant už pėdos distalinio galų, suduodama per Achilo sausgyslę (→ pėda sulėtėja);
   - Stebėk sulėtėjusią relaksaciją (e.g. hypothyroidism) – ji geriausia išryškėja šio reflekso meta!
   a) ligonis guli ant mugaros tiriamųjų
   b) ligonis klūpo ant kedės kraštą
   c) ligonis sėdi nuleidęs kojas:
   d) ligonis guli ant mugaros tiriamųjų
   e) ligonis klūpo ant kedės kraštą
   f) ligonis sėdi nuleidęs kojas:

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5. Jaw jerk n. trigeminus – žandikaulio pakyla, see CN5 testing >>
6. Facial jerk n. facialis - examiner stretches skin of patient's nasolabial fold with index and middle finger of one hand and then taps these fingers with reflex hammer (→ reflex contraction in underlying facial muscles).

B. PERIOSTEAL REFLEXES

1. Brachioradialis (n. Supinator) n. radialis (common)

B. PERIOSTEAL REFLEXES

1. Brachioradialis (n. Supinator) n. radialis (common)
2. Virchowianus n. trigeminus (afferentacja), n. facialis (afferentacja) - skin overlying the muscle (→ contraction in underlying facial muscles).
3. Petros-cerebelli n. - ligamentous stule of the neck, may be absent in both UMN and LMN diseases.

C. JOINT REFLEXES

1. Leri C5-6 suimami I-IV pirštai ir staiga sulenkiami per pamatinus sąnarius, o plaštaka per riešą (→ sulinksta alkūnė).

D. CUTANEOUS REFLEXES

Must travel through cerebral cortex!

1. Abdominal upper Th8-10 n. intercostales, abdominal lower Th10-12 n. iliohypogastricus, n. intercostales - pabraukti per šoninę liniją nuo viršaus žemyn (→ susitraukia pilvo raumens segmentas, bamba patempiama link stimulo):

- may be absent in both UMN and LMN diseases.
- multiparity or obesity may mask this reflex – use your finger to retract umbilicus away from side to be stimulated (feel with your retracting finger for muscular contraction).

2. Plantar L5-S1 - pabraukti pado lateraliniu kraštu nuo kulno aukštyn ir užsukti į paviršių (→ pirštai susilenkia).

- jei įvyksta nykščio dorsifleksija ir kitų pirštų išsiskleidimas vėduokle – ABINSKI response (UMN disease).

- some patients withdraw from this stimulus by flexing hip and knee; hold ankle (if necessary) to complete testing (it may be difficult to distinguish withdrawal from Babinski – quick; Babinski is slow!).

3. Cremaster n. genitofemoralis L1 (afferentacja) L2 (efferentacja) - brūkštelėti vidiniu šlaunies paviršiumi iš viršaus žemyn (→ susitraukia m. cremaster – pakačia skildėlė).

4. Anal wink n. rectalis inf. S2-4 - bakstelėti į išangės odą (→ susitraukia sfinkteris); taip pat patikrinti sfinkterio tonus.

5. Bulbocavernous - squeeze glans penis / clitoris or gently tug uterine catheter (→ pelvic floor musculature contraction felt by finger placed in rectum).

PATHOLOGICAL REFLEXES

A. PYRAMIDAL

- norma rankenks iki 2 metų amžiaus, o iki 6 mėn jie pasireiškia spontaniškai – nespecifiniai, t.y. naujodo pačižaidimu bet kurioje kojose, kor tikspiu nepaklusta vaidmenė vienoje koje.

1. FINGER EXTENSOR REFL -(C7-Th1)

1) Starling - gydytojas karta kartą suila ligonio plūstuką, suilatą delnu žemyn, o delinisios rankos pirštų galais stai, sukultuoja ligonio pirštus iš delnės pusės (→ pirštai linksta žemyn).

2) Trömner - modified Starling reflex - examiner lays fingers of patient's hand on his own and taps his own fingers - sudden stretch on all of patient's fingers (→ reflex flexion of fingers that can be felt by examiner and also observed in thumb as in Hoffman reflex):
1) **Bechterew-Mendel** - plaktuku suduoti per plaktakos **nugarinio** pavidalą.  
2) **Žukovskio-Kornilovo** - plaktuku suduoti per plaktakos **delninio** pavidalą.  
3) **Klipel-Vailia** - suimti II-V **pirštus** ir staiga per riešą atlenkti plaktaką.  
4) **Hoffmann** (→ reflex flexion of fingers, esp. thumb); found in many normal individuals, but it implies decreased inhibition (esp. if asymmetric!):  
   a) middle finger is held between examiner’s second and third fingers and distal phalanx is flicked downward by examiner's thumb.  
   b) "clicking" fingernail of middle finger with examiner's thumbnail:  
   c) gydytojas laiko ligonio III pirštą už vidurinio pirštaikaulio, o kitos rankos dvim pirštais spausdamas galinį pirštaikulį, greit nuo jo mulysta.  
   d) place your right index finger under distal interphalangeal joint of patient’s middle finger; using your right thumb flick patient’s finger downwards:  

Hoffmann sign:  


for **cervical cord compression** - 59% sensitivity, 49% specificity, 35% positive predictive value, and 72% negative predictive value.  

for **brain pathology** - 71% sensitivity, 33% specificity, 10% positive predictive value, and 95% negative predictive value.  

- sensitivity of Hoffman’s sign may be increased by examining the patient during multiple full flexion and extension maneuvers of the neck, to a degree that they can comfortably tolerate (dynamic Hoffman’s sign).  

2. **KOJOS LENKIAMIEJI** (**S1-S2**):  
1) **Rossolimo** - pirštų galais suduoti per ligonio kojos pirštų galus iš apačios (→ pirštai susilenkia).  
2) **Bechterew-Mendel** - plaktuku suduoti per **pėdos** lateralinį kraštą iš viršaus (→ pirštai sulinksta).  
3) **Žukovskio-Kornilovo** - plaktuku suduoti per **pado** lateralinį kraštą (→ pirštai sulinksta).  
4) **Puusepp** - pabraukti adatėle nuo kulno lateraliniu pėdos kraštu (→ V pirštas atsitraukia į šoną).  

3. **KOJOS TIESIAMIEJI** (→ nykštys išsitiesia, kiti pirštai išsiskečia vėduokle):  
N.B. pathologic reflex response is slower than voluntary withdrawal!  

1) **Babinski** S1 (afferentacija), L5-S2 (eferentacija) - pabraukti lateraliniu pado kraštuo nuo kuno aukščio ir po to užšildyti medžiulį.  
2) **Oppenheim** - running your knuckles down shin (from infrapatellar region toward ankle).  
3) **Chaddock** - irritation of external malleolar skin area (rubbing lateral surface of foot with edge of tongue blade or key from heel to little toe).  
4) **Schäffer** - pinching Achilles tendon (pirštais suspausti Achilo sausgyslę).  
5) **Gordon** - pinching calf (pirštais iš šonų suspausti blauzdą raumenis).  
6) **Bing** - pricking dorsum of foot or great toe with pin.  
7) **Strunsky** - pulling little toe laterally away from great toe.  
8) **Throckmorton** - tapping foot dorsum.  
9) **Williams** - gently squeezing metacarpal bones.  

- in setting of forefoot amputation, look for tensor fascia lata contraction when stimulating sole (Brissaud reflex).  

3. **AXIAL**  

**Pectoral** (cord compression in the upper cervical spine C2-C4) - elicited by tapping the pectoralis tendon in the deltopectoral groove → adduction and internal rotation of the shoulder.
4. APHASIA (paireikščia žemiau pažiūrimio) - būt haidu, gniciant temrai pėda, to po klymatu ankščio (→ koja šitaisia arba susitūria, pėda šitaisia).
5. Paratonia - šitaišiški koju pirtis (→ visos kojos susitūriškumas - spinalinis automatizmas).

B. FRONTAL RELEASE signs, s. PRIMITIVE reflexes

- norma atsiruočyto kūkštelį!
- etiology – cortical disinhibition due to lesions of frontal lobes (esp. premotor cortex) - in dementia, pseudobulbar palsy.

CEREBRAL EXAMINATIONS
1) Seat - plaktukų sudėtis per lūpas arba mentele staižiai ir švęliai pabruktai per lūpas (→ atsiranda šūpinimo įsipareigojimai).
2) Sustp. tortuotai - plaktukų švęliai sudėtis per lūpas arba nosies laikų arba mentele staižiai ir švęliai pabruktai per lūpas ir lūpų susitūra ir atsiskiria į priekį (→ jie gali būti susiję su priešą, jei jie yra dėl piramidinių laidų pažeidimo). 1) B. FRONTAL RELEASE
3) Rooting - stroke with your index finger perioral skin.
4) At mouth corners - mouth will open and turn to stimulated side; at midline of upper lip - head will redirect; at midline of lower lip - jaw will drop.
5) Babinski - prislēisti per lūpų (→ stipriai sukanda dantis).
6) Pinch reflex (Ocular-Babinski Reflex) - plaktukio koton padarės m. thuram srirį (→ gali būti susiję su frontal jungtinių smėlių impulsais smėlytais); etiology - dementia (may also be seen in normal elderly individuals!)

GRASPING
1) Tonic grip reflexes
2) Tonic grasp reflex

OTHER FRONTAL RELEASE SIGNS
Glabellar reflex - tapping glabella with finger: normal: few blinks, then cessation; abnormal: continuous blinking with repeated tapping.

Encephalological examination - inability to suppress environmental distractions:
1) imitation behavior - tendency to mimic examiner.
2) antification behavior - tendency to inappropriately take up and use instruments around patient.

Paratonia - see p. Mio: 33

C. NECK TONE AND LARYNTH
1) Magnus-Kling: pasisaky pasukai liniono galvą į priešinę hemiplegijai pusė; jos puseje pavyzdys pėdės ir susitūrimų raumos (rankų šitaisia), o prasidėjusioje pusėje - leidėjų raumų tonusus (rankų susitūrimus).
2) Lifs - pasisaky lankant galvą, kai kaip keltas. see p. 530 kā
3) Shaker - liniono stovė užimtis į priekį rankomis. Kai jis stovė pasukai liniono galvą į smegenų dalį pažiūrimo pusėje, tai jis įtirps rankos, o tos pusės ranka dar ir paskyla.
4) Nucippurimo raumų - liniono stovė užimtis į priekį rankomis aukštyn. Smegenų dalį pažiūrimo pusėje susitūrimas, o taipės ranka išlaisvina iš tos pusės, o tada visai nukrypsta į priekį.
5) Labaileikų - dirbami pirštų laikymo vaikštingų raumų tonusus padidėja, o atsities susitūrimas. Posturainiai (palesta corpus striatum):
- pūnas - gulinčiam ant nagros liniono pasisakyja žemuoje pėda į viršų (toniškai susitūra ir susitūrė mano atrodo, būtų iš tiesų išplesta).
- labaileikų - dirbami pirštų laikymo vaikštingų raumų tonusus padidėja, o atsities susitūrimas susitūriškumas.

DIFFERENTIATION OF MOTOR DYSFUNCTIONS

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Muscle tone</th>
<th>Voluntary movements (limb)</th>
<th>Coordination</th>
<th>Reflexes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory neuron</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
<td>normal (eyes closed)</td>
</tr>
<tr>
<td>Lower motor neuron</td>
<td>atrophy, fasciculations</td>
<td>0</td>
<td>normal</td>
<td>normal</td>
</tr>
<tr>
<td>Upper motor neuron</td>
<td>mild atrophy, Vernicke-Mano syndrome</td>
<td>0</td>
<td>paraplegy</td>
<td>0</td>
</tr>
<tr>
<td>Extrapyramidal</td>
<td>tremor at rest (lead pipe), cogwheel</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
</tr>
<tr>
<td>Cerebellar</td>
<td>intention tremor</td>
<td>normal</td>
<td>poor</td>
<td>normal</td>
</tr>
</tbody>
</table>

Lesion / Disorder

- cerebellar: rapid but atypical or dysmetric
- parkinsonism: slow and hypertonic
- corticospinal tract: slow and clumsy
- apraxia: fail to alternate
- supranuclear, frontal: motor persistence

Feature of coordinated movements

- cerebellar: rapid but atypical or dysmetric
- parkinsonism: slow and hypertonic
- corticospinal tract: slow and clumsy
- apraxia: fail to alternate
- supranuclear, frontal: motor persistence
DETECTION OF MOTOR MALINGERING

- *reflexes (tendon, superficial)* are only truly objective attributes of neurological examination, since patient cannot voluntarily alter them in most cases (patient's relaxation can sometimes influence state of tendon reflexes).
- *sophisticated patient* may be able to fake *Babinski sign,* but experienced observer can usually detect fakery.
- *LA BELLE INDIFFERENCE* — emotionally indifferent attitude toward severe deficit.
- *estimation of motor symptoms* depends on patient's cooperation: patient can voluntarily change level of effort, thus producing impression of weakness; most common patterns:
  1. *sudden collapse of* limb after initial, often normal effort.
  2. *some start to tremor* rather than applying constant pressure as patient tries to simulate less than complete motor function ("misdirection of effort" is one way to describe this behavior).
  3. *some simply refuse to participate in test.*
  4. *when abducted arm is* pushed downward, patient bends his trunk to that side, giving impression that his arm is being pushed downward when in fact relationship with trunk remains same.

Methods to detect *malingered or conversion (historical) weakness:*

- *All are really tests of cooperation and not true weakness* (i.e. they may detect lack of cooperation, but do not fully exclude real weakness — paralyzed patient may not be willing to be tested!)
  1. *test muscle strength* rapidly and simultaneously in arms starting at shoulders and proceeding distally as rapidly as possible so patient does not have time to think about what his response should be (as result, good side may collapse in unison with bad side after initial symmetrical effort - most easily demonstrated when testing abduction of fingers).
  2. *if supposedly weak limb is* dropped, it may fall all less than speed dictated by gravity, may fall with greater force than expected, or may briefly hover in air before patient realizes that limb should be set down.
  3. *with patient lying supine, place one hand* between heel and examining table while testing ability of patient to raise other leg off table:
    - with full effort on heel is table is forced downward to support raising of opposite leg,
    - when full effort is used to raise good leg, one can feel normal downward pressure of "weak" leg,
    - when "weak" leg is supposed to be raised, one may feel very little if any pressure under normal leg, indicating that patient is not trying to raise "weak" leg (in fact, pressure under heel of good leg may decrease - *Heel sign*).
  4. *paralyzed arm* that is held firmly at side will flash back and forth when patient's shoulders are shaken back and forth; if, instead, "paralyzed" arm is observed to remain tightly held against body, it has normal strength and tone.
  5. *observe ease with which patient is able to roll over and move in bed.*
  6. *if patient can be induced, he exhibits behavior that indicates that he is markedly exaggerating effort to take step and in process displays extraordinary strength and coordination;
    - "weak" limb is dragged along ground and not circumstance as in typical UMN disease,
    - falling is common problem and often occurs only in direction of examiner or stretcher where assistants can prevent fall (even two people may have difficulty in supporting patient because patient's efforts are directed toward trying to fall and not toward trying to assist in staying upright).

Key to examination is *skilled observation of stereotyped acts* (e.g. casual observation using supposedly paralyzed arm for balance).

COORDINATION TESTS

**PSYCHOGENIC / PERIODIC dyssynchrony & gait disorders** — see p. Mov? >>

- *Individual's orientation in space depends on four inputs:
  1. visual
  2. vestibular
  3. propioceptive
  4. cutaneous exteroceptors (touch and pressure)*

1. Limb ataxia (atleikama - atismerkus, užsimerkus):

   "Can you please touch your finger to your nose?"

   "Can you please touch your finger to your nose?"

   a) *normal vestibular apparatus -* finger will be brought down several inches to right of nose.
   b) *abnormally responsive vestibular apparatus* - patient may be able to "block" finger when it is moved into position (or vice versa).
   c) *vestibular disorders -* patient may be able to "block" finger when it is moved into position (or vice versa).
   d) *cerebellar disease* - patient may be able to "block" finger when it is moved into position (or vice versa).

2. pro fall patataikyso simptomos (point-to-point)

3. past-pointing — test of *vestibular & cerebellar integration;* patient, seated in *forward chair,* is rotated to right 10 times with eyes closed, then with arm held horizontal, right index finger is brought in touch with tip of examiner's finger; patient is asked to bring arm vertically downward and up again (or vertically upward and down again) to reach examiner's finger:

   a) *normal vestibular apparatus -* finger will be brought down several inches to right of examiner's finger (reverse is true on rotation to left).
   b) *some vestibular disorders -* past-pointing occurs without rotation.
   c) *cerebellar disease -* finger will overshoot point.

"*test may also be used in connection with caloric stimulation.*"
5. **Romberg Test** - rankos įtėjimas į priekį, delnais į viršų*; ligonį prilaikyti iš užpakalio:

1) pėdos greta
2) pėdos vienoje linijoje (tandem) - tandem (s. sharpened) Romberg test - required to reveal abnormalities in younger patients.
3) ant vienos kojos

*In mild hemiparesis or unilateral cerebellar lesion, the legs may drift (pronator drift), alternate, or drift inappropriately.

Neurologic Examination

5. **Romberg test** - rankos įtėjimas į priekį, delnais į viršų*, ligonį prilaikyti iš užpakalio:

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N.B. smegenėlių neįmanoma testuoti neįsakomai ar paralyžuotam pacientui!

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N.B. smegenėlių neįmanoma testuoti neįsakomai ar paralyžuotam pacientui!
N.B. most useful test to quantify balance is eyes-closed tandem Romberg test – išjungiant neįtikėtį stebėjimą, tirk proprioncepciją – linka “pasikliavus” tik vestibulius-ą pratimą, – no patient with bilateral vestibular loss can stand for 6 seconds. – patients with chronic unilateral vestibular loss show very little ataxia - can perform eyes-closed tandem Romberg test.

<table>
<thead>
<tr>
<th>Lesion site</th>
<th>Romberg test</th>
</tr>
</thead>
<tbody>
<tr>
<td>eye-open</td>
<td>eye-closed</td>
</tr>
<tr>
<td>eye-closed</td>
<td>eye-closed tandem</td>
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</tbody>
</table>

**vestibular dizziness**

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**ves...
N. maxillaris - sneeze reflex (CN5) → reticular formation.
N. mandibularis - jaw-jerk reflex (CN5: sensory → CN5: motor):
a) apatiris žandikaulis laisvai mukantis, uždėjus mentę ir prie ją laikant, per ją
suduodama plaktu
b) ask patient to let his mouth hang loosely (closed and jaw relaxed); place forefinger in
midline between lower lip and chin; percuss your finger with tendon hammer.

lesions distal to ganglion - highly focal, circumscribed deficit within one division / subdivision;
ganglion lesions - ipsilateral hemifacial sensory loss*;
lesions of individual trigeminal nuclei (brain stem) - dissociated sensory loss (pain, temperature,
and light touch sensory modalities are differentially affected).

*hemifacial sensory loss:
a) abruptly stops at midline - suspect nonorganic causes!
b) subtle gradation from affected to normal side.

Infant child - sensory function is documented by facial grimacing from pinprick (away from eye) or by
stimulating nostril with cotton tip.

Skausmingumas šakų išėjimo vietose (trigger points) (trigeminal neuralgia, postherpetic neuralgia)
- apatiris su piršteliais:
a) virš antakių - foramen supraorbitale
b) fossa canina - foramen infraorbitale
c) smakras - foramen mentale

MOTOR - kramtomųjų raumenų f:
• sukanda dantis ("Clench teeth") - pridėti rankas prie m. masseter, po to m. temporalis – bulk and
symmetry:
• stengiasi išsižioti esant pasipriešinimui (mandibula nukryps į nusilpusio m. pterygoideus puoš
-perferminis CN5 paralyžius; centrinis - mandibula refleksas†); if it is difficult to open mouth against resistance, some degree of CN7 weakness is likely!
• jaw jerk reflex. see above >>

CN7 (N. FACIALIS)

 Temporal muscle
N7 MOTOR
Sensory—facial. The nerve has three divisions:
I. ophthalmic, II. maxillary, and III. mandibular.
MOTOR (simetriškumai + upper face vs. lower face!) - demonstrate yourself and then asking patient to mimic:

1) frown (wrinkle) forehead, raise eyebrows (or look up above his head)
- slowed blinking.  
- Bell phenomenon - upward and outward rolling of globe when eyelid closure is attempted (nogalių užsimerki, obuolys refleksiškai nukrypsta link ašarų liaukos – ragenų apsuga).
- testing for eyelid position → see p. D1

2) close eyes tightly so that you cannot open them (test muscle strength by trying to open them by retracting lower lid); “Screw your eyes tightly shut and stop me from opening them” → slowed blinking.
- Bell phenomenon - upward and outward rolling of globe when eyelid closure is attempted (nogalių užsimerki, obuolys refleksiškai nukrypsta link ašarų liaukos – ragenų apsuga).

3) bare teeth, smile, puff out cheeks, pašvilpti “Blow out your cheeks with your mouth closed” → flattening of nasolabial groove, loss of facial wrinkles.
- pronounce LABIAL SOUNDS (dizartrija) - M, B, P.  
- “Say baby hippopotamus”

- detailed examination of peripheral branches:
  1) TEMPORAL - raise eyebrows, wrinkle brow;  
  2) ZYGOMATIC - close eyes, corneal blink reflex;  
  3) Buccal - smile, show teeth, puff out cheeks;  
  4) MANDIBULAR - pout, purse lips;  
  5) CERVICAL - sneer.
- do not confuse transferred contralateral motion with weak motion of involved side (H: holding skin of uninvolved side against facial skeleton, midfacial motion from contralateral side can be minimized).
- do not confuse active eye closure with normal, gravity-assisted passive eyelid closure.
- check preservation of emotional facial expressions (e.g. surprise, pain).

SCHNEIDER test:  
- standard sterile filter paper strips are folded into shape of hook and placed into each lower conjunctival fornix.  
- after 5 minutes, degree of wetting is measured and compared between sides.  
- unilateral reduction > 30% of total amount of lacrimation of both eyes or bilateral tearing < 15-25 mm is considered abnormal.

PARASYMPATHETIC - burns dūtivimas, atarą sekrecija.
- check preservation of emotional facial expressions (e.g. surprise, pain).

SENSORY - skonio įtumas liežuvio priekiniais 2/3.
- patients must not to eat / smoke for several hours before testing.
- before each test solutions are applied, mouth is rinsed with DISTILLED WATER.
- cotton-tipped applicators moistened in appropriate solution are placed on lateral margin of protruded (!) tongue halfway back from tip - ligonis kortelė su skonio užrašu: salt (NaCl), sweet (sugar), bitter (quinine), sour (lemon or vinegar), unknown, without taste.

- instruct patient not to speak during test!

PARASYMPATHETIC: 
- warn patient that you are going to test his gag reflex (CN9 → CN10): tactile stimulation of walls of pharynx (CN9) or posterior tongue, faucial pillars (CN10) - use blunt object (e.g. tongue blade);
apply stimuli to both sides in turn → symmetrical contraction and elevation of pharynx and tongue retraction.

- bilateral absence of gag reflex may be normal (esp. in elderly, smokers)!

- ask to puff out cheeks with lips tightly closed → look / feel for air escaping from nose.

- carotid sinus reflex: carotid artery massage → bradycardia (CN9 → CN10).

Heart rate is influenced by numerous factors - testing reflexes is not reliable!

CN10 palsy on left side (soft palate deviates toward healthy side during phonation):
b) sublingual leucovio rape su centriniu tarpdantčiu.
- speed and range of motor - wibble tongue rapidly from side to side, point tip upward and downward.
- "Stick out your tongue. Place it on upper lip, move it side to side!"
- strength of motion - press tongue into cheek - examiner feels from outside mouth and compares strength symmetry on both sides.
- LINGUAL SOUNDS (dyshartria) - T, D, L. "Say "yellow lorry"!
- OXYGENESIS (initial stage of swallowing).

Infant child – pinch nostrils; this will produce reflex mouth opening and tongue tip raising (in CN12 paresis, tongue tip will deviate toward affected side).

**CEREBROVASCULAR - AUTONOMIC NS EXAMINATION**

- **PUPIL & OPTIC/HISTOSCOPE**
- **LARYNGEAL RESECTION**
- **CAROTID SYMPTOMS:**

1. **PALSAS** (svečiui!):
   1) a. temporalis superficislis (just in front of ear) - enlargement or tenderness?
   2) a. carotis pulse

2. **ANORMA?** (with bell-type stethoscope):
   1) pradėdami nuo aortos ventūros – a. subclavia (above and below clavicle) – kiek ekstenduoti aortos ventūro ūžesį transmisią į a. carotis.
   2) kalto auskultuoti (galvo pasukta į prietūgos pusę) - auskultuoti:
      a) už m. sternocleidomastoideus (a. vertebralis)
      b) prieš m. sternocleidomastoideus, klinty iki už angle of mandible (a. carotis com. bilateraliu c. - cart. thyroidea viršutinis kraštas, 3 cm below angle of mandible).
   3) smilkinių
   4) processus mastoides
   5) akį.

3. Ortostimos, pul s Zabaltas mėgina metus (lack of bradycardia-tachycardia?).
4. AKS abejose (?) rankose (test for painless aortic dissection as cause of stroke?).
- Cushing response (to ICP↑)

5. **Orthostatic vital signs:**
   - normal klininio reflex - per pinpiaus 15-20 sek pulsus sultėtų 4-6
   - normal klininio reflex, o AKS sumūžėjo 5-10 mmHg.
   - normal klininio reflex - pulsas padidėjo (lack of bradycardia)?
   - normal klininio reflex - pulsas naujikinosisis (lack of bradycardia)?
   - normal klininio reflex - pulsas naujikinosisis (lack of bradycardia)?
   - normal klininio reflex - pulsas naujikinosisis (lack of bradycardia)?
   - normal klininio reflex - pulsas naujikinosisis (lack of bradycardia)?
**Skin**

1. **Dermografinas** - buka daiktu ar adatėle braukiant per krūtinės, pilvo odą (normoje kelias sek baltas, po to raudonas nepakilęs pėdsakas).

2. **Loss of sweating** - lightly draw dorsal surface of forefinger (or spoon) up torso skin (starting below expected level of lesion and stroking upward); finger slides easily over smooth dry skin below lesion but sticks momentarily as it meets normal moist skin at upper border of lesion.

   - Look also for asymmetrical patterns of skin temperature or colour.

**Bladder & Anus**

1. Ability to initiate and interrupt micturition voluntarily.

2. Bulbocavernous and anal reflexes.

3. Scrotal and internal anal reflexes.

4. Palpation / percussion of bladder (abnormal bladder distention?).

**Peripheral NS Examination**

See also *Motor Examination (above)* >>

Tiriant periferinę NS, svarbu diferencijuoti — pakenkimas turi **SEGMENTAL** (dermatome, myotome, sclerotome) **PERIPHERAL NERVE** distribution!!!

**Tinel’s sign**: percussion along course of nerve → paresthesia in nerve distribution.

**Cervical Roots**

### C4

- **Pain**: Top of shoulder, radiating to medial scapula.
- **Sensory Loss**: Supraclavicular fossa.
- **Motor Signs**: Flattening or flabbiness of rhomboid palpated through trapezius as the patient “pulls the shoulders back like a Marine.”

### C5

- **Pain**: Lateral shoulder and arm.
- **Sensory Loss**: Skin over deltoid muscles.
- **Motor Signs**: Supraspinatus, infraspinatus, deltoid, biceps, brachioradialis. Depressed biceps reflex.

### C6

- **Pain**: Radiating from neck to radial side of forearm and thumb.
- **Sensory Loss**: Distal thumb.
- **Motor Signs**: Supraspinatus, infraspinatus, deltoid, biceps, brachioradialis, and triceps. Depressed biceps and triceps reflexes.

### C7

- **Pain**: Radiating from neck to the hand.
- **Sensory Loss**: Middle finger and middle palm.
- **Motor Signs**: Triceps, wrist extension, wrist flexion. Depressed triceps reflex.

**Clinician Beware!** Carpal tunnel syndrome is a common cause of pain in the upper extremity. The pain of carpal tunnel syndrome may exactly mimic the pain of lower cervical root involvement and may be mistaken for a radicular syndrome. If there is no definite weakness or sensory loss proximal to the wrist, consider carpal tunnel syndrome!
Su rankos nykščiu galima prastauti visas tris nervus:

ekstenzija – N.RADIALIS (m. extensor pollicis longus et brevis),
opozicija – N.MEDIAANUS (m. opponens pollicis),
addukcija – N.ULNARIS (m. adductor pollicis).

abdukcija – N.RADIALIS (m. abductor pollicis longus) + N.MEDIAANUS (m. abductor pollicis brevis),
fleksija – N.ULNARIS (m. flexor pollicis brevis, deep head) + N.MEDIAANUS (m. flexor pollicis longus et brevis, superficial head).

<table>
<thead>
<tr>
<th></th>
<th>Hand intrinsics</th>
<th>Abductor pollicis brevis</th>
</tr>
</thead>
<tbody>
<tr>
<td>C8 radiculopathy</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Ulnar neuropathy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median neuropathy</td>
<td>*</td>
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</tr>
</tbody>
</table>

DORSAL SCAPULAR NERVE (C4-5)

Fig. 4. Rhomboids (Dorsal scapular nerve: C4, C5)
The patient is pressing the palm of his hand backwards against the examiner’s hand.
At this point, the rhomboids can be felt and sometimes seen.

LONG THORACIC NERVE (C5-7)
m. serratus anterior – "winged scapula" (inferior tip of scapula juts backward and medially) – įvykis, kai:

a) pacienas ranka bandovo į priekį nejudinantį objektą (pvz. sieną).

b) paciento abduktuvą įstatėjus į žemyn link korpuso (pacienas tam priešinosi).

Winging is usually absent when arm is held at side!
**MEDIAL PECTORAL NERVE (C6-7)**

- **Fig. 6** Portoculis Major: Clavicular Head Lateral pectoral nerve, C6, C7
  - The upper arm is above the horizontal and the patient is pulling forward against the examiner’s hand. Across the clavicular head of pectoralis major can be seen and felt.

- **Fig. 7** Portoculis Major: Sternocostal Head Lateral and medial pectoral nerves, C6, C7, C8
  - The patient is adducting the upper arm against resistance. Across the sternocostal head can be seen and felt.

**SUPRASCAPULAR NERVE (C5-6)**

- **Fig. 8** Portoculis Major: Clavicular Head Lateral pectoral nerve, C6, C7
  - The upper arm is above the horizontal and the patient is pulling forward against the examiner’s hand. Across the clavicular head of pectoralis major can be seen and felt.
THORACODORSAL NERVE (L6-S1)

THORACODORSAL NERVE (L6-S1)

SUBCAPULAR NERVE (C5-7)
Fig. 12 Teres Major (Subscapular nerve: C5, C6, C7)
The patient is adducting the elevated upper arm against resistance. Arrow: the muscle belly can be seen and felt.
Fig. 14  “Biceps” (Musculocutaneous nerve; C5, C6)
The patient is flexing the supinated forearm against resistance. Arrow: the muscle belly can be seen and felt.

Fig. 75 The approximate area within which sensory changes may be found in lesions of the musculocutaneous nerve. (The distribution of the lateral cutaneous nerve of the forearm.)

Fig. 76 The approximate area within which sensory changes may be found in lesions of the radial cutaneous nerve of the forearm. Light touch, continuation test, percussion, distal line.

**Axillary Nerve (C5-6)**

- Dorsal scapular nerve to rhomboids
- Nerve to subscapular
- Suprascapular nerve to supraspinatus and infraspinatus
- Posterior cord
- Median nerve
- Musculocutaneous nerve
- Axillary nerve
- Radial nerve
- Lateral cord
- Median nerve
- Medial cord
- Thoracodorsal nerve
- Nerve to latissimus dorsi
- Subscapular nerve
1. **Motor – interossei** (grip and pinch muscles): see p. PN5 >

a) hypothenar, mm. interossei atrophy (neurological changes affecting the hypothenar muscles – mm. interossei dorsalis III et palmaris III silpnumas)

b) bando tiesti pirštus – bet tiesiasi tik MP ("grifo ranka" – neįgalių pirštų digitų egzistavimas)

c) "claw hand" (main en griffe) - III-V fingers hyperextended at MCP joints (paralysed mm. interossei and mm. lumbricales ulnares)

* "claw hand" occurs only in lesions at wrist level

d) test interossei: ask patient to hold sheet of light card between fully extended little and ring fingers.

e) test first dorsal interosseus muscle - negali padaryti sprigto; ask patient to abduct extended index finger against resistance.
2. Sensory - skrininės testų palmar tip 5-ojo linkso.

**Proximal Ulnar nerve**

![Proximal Ulnar nerve](image1.jpg)

**Fig. 38** Flexor Carpi Ulnaris (Ulnar nerve: C7, C8, T1)
The patient is flexing and adducting the hand at the wrist against resistance. Arrows: the tendon can be seen and felt.

**Fig. 39** Flexor Digitorum Profundus III and IV (Ulnar nerve: C7, C8)
The patient is flexing the distal interphalangeal joint against resistance while the middle phalanx is fixed.

**Distal Ulnar nerve**
Median Nerve (C6-T1)

1. Sensory (+ causalgia) - screen with palmar tip of 2nd finger.
2. Motinė - pronacija, I-III pirštų sulenkimas ir pilnas ištiesimas, nykščio opozicija:  
a) thenar atrofija;
b) “hand of benediction”;
c) nesuima I ir II pirštų galais lapo popieriui; liepk I ir II pirštais padaryti “O” raidę ir neleisti pratepti šių tarp šių pirštų;
d) gniauziant kumštį nelinksta I-III.
e) test abduction: place hand flat, palm up, on table; ask patient to abduct thumb (vertical movement up from palm) and to hold it in that position against resistance:
f) test opposition: ask patient to touch tip of little finger and keep it there against resistance:

Proximal Median nerve (C6-7)
Anterior Interosseus branch (C7-8)
Distal Median nerve (C8-T1)

1. Sensory (no pain) – screen with dorsal aspect of skin web between 1st and 2nd fingers.
2. Motor – extension in all arm joints, supination: see p. PN5 >
   a) "wrist drop"
   b) triceps reflex
   c) triceps strength
   d) ask to flex elbow to 90° and pronate wrist; support wrist with your hand and ask patient to extend fingers and then extend wrist (when assessing finger extension watch MCP joints as extension of IP joints can also be produced by interossei and lumbrical muscles supplied by median and ulnar nerves)
   e) brachioradialis
f) supination↓

g) extensor carpi radialis↓

Posterior interosseous branch
LUMBOSACRAL PLEXUS

Quickest screening for lumbosacral radiculopathy:
- knee-jerk (L4)
- great toe dorsiflexion (L5)
- ankle-jerk (S1)
1. **Neuralgia** - root stretch test - positive if skauda kirkšnį, šlaunies priekį:
   a) sunkūs laiptai ar į kalną
   b) patellar reflex↓
   c) einant meta koją į priekį
   • when patient stands erect, leg is held stiffly extended by contraction of tensor fasciae femoris and gracilis; walking on level ground is possible as long as leg can be kept extended, but if slightest flexion occurs, patient sinks down on suddenly flexed knee.

2. **Motor** - pėdos ir pirštų lenkimas, pėdos sukimas į vidų:
   a) nepasistiebia ant pirštų
   b) Achillo reflex↓
   c) pes valgus

3. **Sensory** - blauzdos postero medialinis ir apaninis, pėdos dorsolateralinis ir plantarinius paviršius.
MENTAL STATUS EXAMINATION (MSE)

As a quick screen - ask patient to draw clock with hands at set time (e.g. 10 min before 2:00) - very informative regarding cognitive status, visuospatial deficits, ability to comprehend and execute instructions in logical sequence, and presence or absence of perseveration.

More complete examination is NEUropsychological testing. see p. D12.

- make patient physically comfortable and (if possible) mentally at ease; otherwise, obtained information may reflect a response interaction.
- special introduction: "I have listened to your lungs and heart. To study how your brain is working, I have a series of questions that I ask of every patient" - it obviates any patient's fear that he has been singled out for test because something is amiss.
- avoid saying, "some of these questions are very easy" (if individual cannot answer them, he may feel truly inadequate).
- parapraxia; arrhythmia, slurred, slurred psychotic status as an anesthetic.

1. Level of consciousness
2. Primary sensory systems (visual, auditory, tactile, proprioceptive)
3. Effector systems (basic motor, vocal, praxis).
4. Attention & vigilance
5. Orientation
6. Language

Level of consciousness:
- orientation to person
- orientation to place
- orientation to time

Effector systems:
- primary sensory systems (visual, auditory, tactile, proprioceptive)
- motor response (interference with apraxia).

Attention & vigilance:
- ability to shift attention from one stimulus to another.

Orientation:
- ask patient to point to window, door, and ceiling in specific sequence; requires awareness, directed attention of ≈ 1 second.

Language:
- ask for "A & O x 3" = alert and oriented to time, place, and person

2. ATTENTION & VIGILANCE

1) observing if patient is not oriented while taking history and conducting examination ("disturbed" patient - attention shifts from one stimulus to another).

2) DIGIT SPAN (forward and reversed) test - measures attention of ≈ 1-second duration.

- examiner should intone numbers, without inflection, at rate of one number per second.
- numbers should be read from prepared list to ensure smooth delivery.
- ability to reverse digits requires more concentration than forward repetition.
- if this test is repeated to evaluate clinical progress, numbers should be changed daily.

Normal score:
- for adults 5-7 digits forward and 5 digits reversed.
- for elderly 5 digits forward and 3-4 digits reversed.

3) CPT (continuous performance testing) - measures vigilance (concentration) of ≈ 1-minute duration.

- examiner reads letters aloud, with uninflected and monotonous delivery, at rate of one letter per second.
- patient is asked to tap with finger (or pencil) whenever "A" is read aloud from list of letters.
- normal adult usually makes no errors on this test.

3. ORIENTATION

1. Orientation to time: "What is today's date?" "Month?" "Day of the week?" "Year?".
2. Orientation to place: "Where are you now?" "What state are you in?" "County?" "City?" "What is the name of this place?".
3. Orientation to person: "What is your name?", "Names of relatives and professional personnel", identify which finger has been stimulated by examiner under visual guidance, and in absence of visual input (Finger Localization Test).

N.B. Loss of orientation to person as isolated symptom suggests maligning!

"A & O x 3" = alert and oriented to time, place, and person.

4. LANGUAGE

Ask for HANdNESS! (which hand patient uses to write, eat, and throw a ball)

Six main parts of language examination:
1) SPONTANEOUS speech (fluent/nonfluent); e.g. words per minute (in English, normal is 50-150), phrase length (≥ 4 words per phrase).
2) auditory COMPREHENSION:
   a) conversation - ordinary conversation probes patient's ability to understand questions;
   b) commands - series of single or multistep commands;
   c) yes and no answers (e.g. "are the lights on in this room?");
   d) pointing - ask to point to window, door, and ceiling in specific sequence; requires limited motor response (interference with apraxia).

N.B. don't give nonverbal clues!
1. READING aloud and for comprehension (ask fifth-grade level questions from text): sample text:

The helicopter is a most unusual aircraft. It can rise straight up, descend straight down, fly forward, or fly backward. It can also fly very slowly and even remain in one place while in midair. These special flying features of the helicopter make it valuable in search and rescue missions because it has the ability to take off and land in a small amount of space.

2. PRACTICE: to-command task - request to pantomime to verbal command:

a) Show common object (e.g. nail, screwdriver, and hammer).

b) Give simple three-stage command: place it under the book.

c) Ask patient to perform task that requires to cross patient’s midline. These special flying features of the helicopter make it valuable in search and rescue missions because it has the ability to take off and land in a small amount of space.

3. ANOMIC paradigm: (e.g. “Today is Tuesday”).

4. Ask patient to read passage from newspaper.

5. Ask patient to write sentence.

6. Papildomai stebėma: PRÖSTRO (kalbos melodijos, emocinio atspūdavo)

ASSOCIATED SIGNS (visual field defects, hemisensory, hemimotor loss, praxis, memory)

ASSOCIATED SIGNS

- Visual field defects
- Hemi sensory deficits
- Hemimotor loss
- Praxis
- Memory

**APHASIA**

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<tr>
<th>Broca</th>
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<td>Impaired</td>
<td>Poor / Good</td>
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<td>Conduction</td>
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<td>Impaired</td>
<td>Impaired</td>
<td>Poor / Poor</td>
<td>RHH, RHS, RHH</td>
<td></td>
</tr>
</tbody>
</table>

Anomic

- Fluent | Normal | Impaired | Normal | Poor / Poor | RHP |
- Nonfluent | Nonfluent | Normal | Normal | Poor / Poor | RHP, RHS |
- Motor sensory | Impaired | Normal | Normal | Poor / Poor | RHH |
- Motor sensory | Impaired | Normal | Normal | Poor / Poor | RHH |

5. MEMORY:

First goal is to ascertain that memory impairment is not secondary to specific perceptual, motor, cognitive disability or broad impairment of mental status - toold prielf tai būtina sitūacija sensory & motor systems, attention, vigilance, etc.

- **IMMEDIATE MEMORY** (1. WORKING MEMORY, ATTENTION, 2. DIGIT SPAN TEST (attention testing).

- **LONG-TERM MEMORY** (3. RECENT MEMORY, SHORT-TERM MEMORY in standard neurological usage.

LEARNING:

1. Remember and later recall (e.g. after 3-minute) 4 words that are diverse semantically and phonetically (e.g. hammer, yellow, anger, sofa).

- warn patient that memory will be tested for information.
- have patient immediately repeat words or name objects - to rule out attentional, perceptual, and linguistic bases for any later memory failure.
- delay must be filled with activity (e.g. counting); otherwise, patient may quietly rehearse words.
- normal adult recalls all 4 words; recall of 3 words is normal in elderly; recall ≤ 2 words suggests ANTEROGRADE AMNESIA.

2. Ask for events of the day – make sure that you can check answers against other sources (distinguish comprehension from today’s weather, today’s appointment time in clinic, medications & laboratory tests taken during day).

3. REMOTE MEMORY (1. LONG-TERM MEMORY in standard neurological usage, INTELLIGENCE) – ask patients to recall:

a) details of own medical history
b) past personal facts (birthdays, anniversaries, names of schools attended, jobs held)

c) historical facts (e.g. names of the last six presidents or wars).

- evaluates possibility of KETTROGADE AMNESIA.

6. PRACTICE:

- examine both right and left arms; when one arm is weak (or has another motor disorder), nonparietal limb should be tested.

- same items should be used for all subtests (e.g. nail, screwdriver, and hammer).

- use commands requiring to cross patient’s midline (e.g. u deline ranka paliesti kairę aias).

- notice whether patient can discriminate between well and poorly performed tests.

1. IMITATION test - ask to imitate examiner performing gestures.

2. Pantomime-to-command test - request to pantomime to verbal command:

a) Transitive gestures (i.e. using tool and instrument, e.g. "Show me how you would use bread knife to cut slice of bread")

b) Intransitive gestures (i.e. communicative gestures such as waving goodbye)

- perform task that requires several sequential motor acts (e.g. making a sandwich)
3. Allow patient to see and hold actual tools / objects and ask to demonstrate how to use tool / object.

4. Whether patient can match tools with objects on which they operate (e.g. given partially driven nail, will he select hammer?).

5. Whether patient can develop tools to solve mechanical problems.

Ask patient to put on pyjama top or dressing gown, one sleeve of which has been pulled inside out.

7. CONSTRUCTIONAL (GRAPHOMOTOR) ABILITY

- ability to copy / draw 2- or 3-dimensional shapes

- patient must copy on blank unlined paper sheet.
- excellent screening test - involves visual, perceptual, analytic, motor functions.

8. FUND OF INFORMATION / VOCABULARY Evaluation - bright, average, dull, overtly retarded, demented.

N.B. always consider patient’s cultural and educational background!

I. Patient is asked questions that assess his store of knowledge or general information.

- How many minutes are in an hour?
- What is the function of the kidneys?
- What we do celebrate on the 4th of July?
- What is the capital of Greece?
- What is hieroglyphic?
- How many miles lie between San Francisco and New York?
- Who wrote “Paradise Lost?”

II. Vocabulary (best indicator of intelligence!)

- ask patient to give meaning of following words (or to use each word in sentence):
  - Apple [obuolys]
  - Microscope [mikroskopas]
  - Donkey [asilas]
  - Stanzas [stanzas, strofa]
  - Diamond [deimantas]
  - Guillotine [giljotina]
  - Nuisance [nemalonumas]
  - Plural [daugiskaita]
  - Fur [kailis]
  - Spangle [blizgutis, blizgalas]
  - Shilling [lingas]
  - Recede [atsitraukti]
  - Bacon [puskiaulio mėsa]
  - Affliction [sielvartas]
  - Diamond [deimantas]
  - Guillotine [giljotina]
  - Nuisance [nemalonumas]
  - Plural [daugiskaita]
  - Fur [kailis]
  - Spangle [blizgutis, blizgalas]
  - Shilling [lingas]
  - Recede [atsitraukti]
  - Bacon [puskiaulio mėsa]
  - Affliction [sielvartas]
  - Nitroglycerine [nitroglicerinas]

- average intelligence – must define 8-16 words.

9. CALCULATIONS

- ability to perform mental arithmetic (e.g. SERIAL SEVENS - ask patient to begin with 100 and count backward by 7; stop after five subtractions (93, 86, 79, 72, 65).
- if patient cannot complete serial 7s, try serial 3s, or just counting backwards (in this case, any error is failure).
- performance is highly correlated with concentration, intelligence, and education.

10. ABSTRACT THINKING

1. Similarities - patient is asked to identify essential relation between word pairs (e.g. turnip and cauliflower, chair and table, painting and symphony).

2. Comprehension, s. proverb interpretation (depends on cultural, intellectual, and educational background!)

- possible questions include:
  - “What would you do if you smelled smoke in your apartment?”
  - “What would you do if you found a self addressed envelop on the street?”
  - “What would you do if you saw a 2-year-old child playing at the end of a pier?”

11. CONCEPTUAL ABILITY

- patient is asked to complete series of letter and number sequences that are printed on card:

12. JUDGMENT

- patient's understanding of what he has done or will do in various situations.

- possible questions include:

13. INSIGHT (NOSOGNOSIA)

- patient's awareness of significance of her symptoms and illness:
  - understanding degree of illness
  - understanding need for help, hospitalization, agree to management plan
14. GENERAL BEHAVIOR AND APPEARANCE

1. Is patient clothing & grooming appropriate?
2. Psychomotor activity, facial expression, position, gait: normal, agitated, hyperactive, hypoactive, repetitive acts, tics.
3. Interview behavior: hostile, angry outbursts, cooperative, evasive, impulsive, irritable, passive, apathetic, withdrawn, silly, helpless, unconcerned, euphoric, demanding, negativistic.

15. THOUGHT

Thought "PROCESS" (a form of thought, mechanics of thinking): for definitions → see p. Psy5 >>

1. Reduced content, incomplete sentences
2. Circumstantiality
3. Tangentiality
4. Detrailment
5. Clang associations
6. Blocking
7. Flight of ideas
8. Confabulation
10. Word salad, neologisms

Thought CONTENT: ask open-ended question, such as, "What's on your mind?". for definitions → see p. Psy5 >>

1. Perception disorders:
   1) illusions
   2) hallucinations
   3) depersonalization, derealization.
2. Delusions
   N.B. delusions are fixed – cannot be corrected by physician – physician should not pretend to agree with delusion but should take neutral position (contradiction to patient’s delusional belief may cause patient to become angry and stop interview!).
3. Homicidal thoughts & plans
4. Suicidal thoughts & plans
5. Feelings of hopelessness, worthlessness, guilt, anhedonia
6. Obsessions
7. Phobias
8. Sexual concerns
9. Somatic preoccupations
10. Religiosity

16. EMOTIONAL STATE

Ask: “How are your spirits?”

1. Mood / affect – angry, sad, apathetic (flat affect), fluctuating (labile), happy, fearful, anxious.
2. Are mood and affect the same?
3. Is mood / affect appropriate to verbal content, topics of discussion?

In suspected depression – ask as far as patient’s positive answers warrant:

- “Do you get pretty discouraged (or depressed or blue)?”
- “How low do you feel?”
- “What do you see for yourself in the future?”
- “Do you ever feel that life isn’t worth living? Or that you had just as soon be dead?”
- “Have you ever thought of doing away with yourself?”
- “How did (do) you think you would do it?”
- “What would happen after you were dead?”

BIBLIOGRAPHY for ch. “Diagnostics” → follow this LINK >>