Brain Stem LESIONS

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* brain stem sandara labai sudėtinga – kompaktiškai susiglaudę guli įvairiausios struktūros.
* neįmanoma aprašyti visų galimų sindromų.
* patogiausia nagrinėti *kraujagyslinius sindromus* – geriausiai koreliuoja su topografija.

Clinical features depend on:

1. **Longitudinal site** (midbrain, pons, medulla)
2. **Cross-sectional site** (tegmentum vs. basis; medial vs. lateral)

**Unilateral brain stem syndromes** – alternating signs:

1. Ipsilaterally – lesion of ***cranial nerves*** (LMN paralysis or loss of sensation) – specifies **longitudinal site**.
2. Contralaterally – lesion of ***long tracts***, which will decussate (descending) or has decussated (ascending) – specifies **cross-sectional site**;
   * alternating hemiplegia – tr. pyramidalis (dažnai kartu pažeidžiami somitiniai nervai CN3 (Weber syndrome), CN6 (Foville syndrome), CN12 (Dejerine syndrome) – jie išeina ventraliai paramedianinėje plokštumoje, šalia tr. pyramidalis).
   * alternating hemianesthesia – medial lemniscus, tr. spinothalamicus.
   * alternating hemihyperkinesia – subst. nigra (tremor), red nucleus (hemichorea).

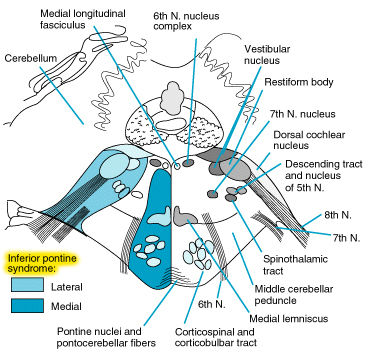
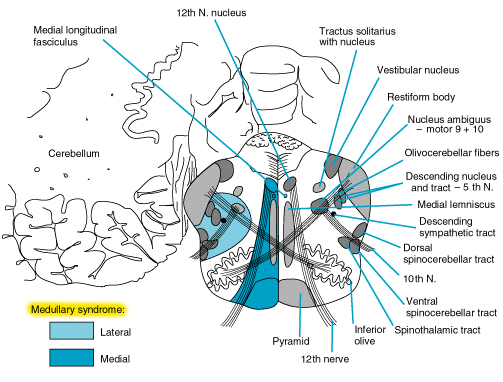
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Lateral | | | Medial | | |
|  | **Long tracts** | | **Cranial nerves** | **Long tracts** | | **Cranial nerves** |
| Pons | TrSpinthal TrRetspin  VestConn  LatLem | Hiccup | CN5 (touch)  CN7 (motor)  CN8 | TrPyr  MedLem CerebellConn | Palatal myoclonus, etc | CN6 + pontine gaze center,  MLF |
| Medulla | TrSpinthal TrRetspin VestConn CerebellConn | CN5 (pain + t-re)  CN7 (taste)  CN9  CN10 | TrPyr  MedLem | CN12 |

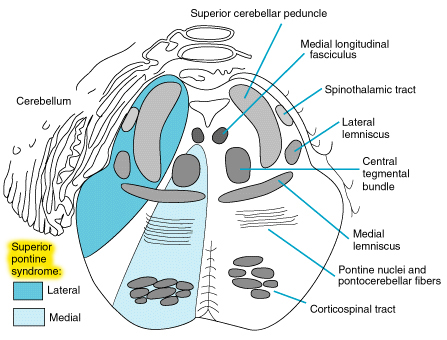
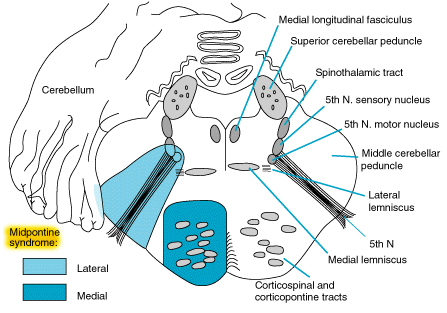
**Bulbar Palsy** – *peripheral* paralysis of CN9, CN10, CN12. [see p. Mov3 >>](http://www.neurosurgeryresident.net/Mov.%2520Movement%2520disorders,%2520Ataxias\Mov3.%2520GENERAL%2520-%2520UMN%2520(pyramidal)%2520&%2520LMN%2520Disorders.pdf#BULBAR_PARALYSIS)

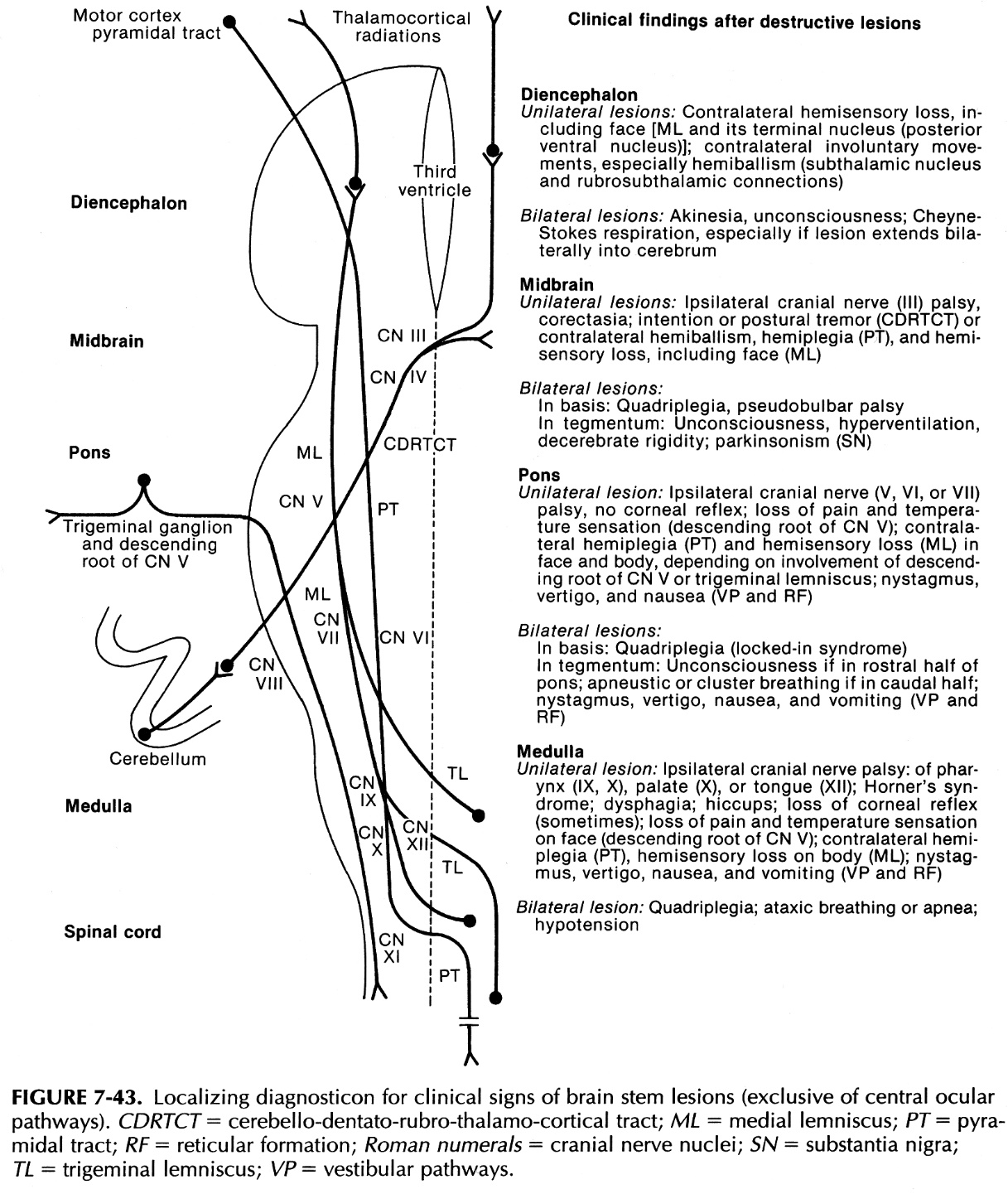
**Pseudobulbar Palsy** – *central* paralysis of CN7, CN9, CN10, CN12. [see p. Mov3 >>](http://www.neurosurgeryresident.net/Mov.%20Movement%20disorders,%20Ataxias\Mov3.%20GENERAL%20-%20UMN%20(pyramidal)%20&%20LMN%20Disorders.pdf#PSEUDOBULBAR_PARALYSIS)

Bilateral lesion of tegmentum above midpontine level (rostral RF – ARAS) → **coma**. [see p. S30 >>](http://www.neurosurgeryresident.net/S.%2520Symptoms,%2520Signs,%2520Syndromes\S30-34.%2520Alterations%2520of%2520Consciousness,%2520Coma,%2520Vegetative%2520State,%2520Brain%2520Death\S30.%2520Alterations%2520in%2520Level%2520of%2520Consciousness,%2520Coma.pdf)

**Respiratory drive disturbance** – kuo kaudalesnis pažeidimas, tuo labiau trinka kvėpavimo dažnis ir ritmas; medulocervikalinis pažeidimas → apnea. [see p. 2115 (4-5) >> (respiratory)](http://www.neurosurgeryresident.net/USMLE%202\Respiratory%20system%20(2101-2200)\2115%20(04).jpg)







Medial syndromes of medulla and pons

- paramedian branches of a. vertebralis / a. basilaris.

Long tracts:

1. **Tr. pyramidalis** → (contralateral) hemiplegia
2. **Medial lemniscus** → (contralateral) loss of tactile (?), position and vibratory sensation.
3. **Cerebellar connections** (superior / middle cerebellar peduncle;in pons only) → (ipsilateral) limb ataxia or nystagmus.

Pažeidimo aukštį nurodo įtraukti nervai:

Medial medullary (s. **Dejerine**) syndrome:

**CN12** → (ipsilateral) tongue hemiparalysis.

Medial pontine syndrome:

1. **CN6 nucleus**, **pontine gaze center** → paralysis of horizontal gaze to side of lesion.
2. **MLF** → internuclear ophthalmoplegia (failure of adduction in horizontal gaze but preservation of convergence). [see p. Eye64 >>](http://www.neurosurgeryresident.net/Eye.%2520Ophthalmology\Eye64.%2520Gaze%2520and%2520Autonomic%2520Innervation%2520Disorders.pdf#INO)
3. **Central tegmental tract** → palatal myoclonus accompanied by rhythmic movements of pharynx, larynx, face, eyes, or respiratory muscles.

* gaze-evoked nystagmus – due to vestibular connections, cerebellar connections, MLF.

**Foville syndrome** (variant of alternating hemiplegia) – ipsilateral CN6, contralateral hemiplegia.

**Millard-Gubler syndrome** (variant of alternating hemiplegia) – ipsilateral CN7, contralateral hemiplegia.

**Locked-in Syndrome** – complete lesion of basis pontis. [see p. Mov3 >>](http://www.neurosurgeryresident.net/Mov.%20Movement%20disorders,%20Ataxias\Mov3.%20GENERAL%20-%20UMN%20(pyramidal)%20&%20LMN%20Disorders.pdf#Locked_in)

**Drop Attacks** – TIA in bilateral pontine / medullary pyramidal tract. [see p. Mov3 >>](http://www.neurosurgeryresident.net/Mov.%20Movement%20disorders,%20Ataxias\Mov3.%20GENERAL%20-%20UMN%20(pyramidal)%20&%20LMN%20Disorders.pdf#DROP_ATTACK)

Lateral syndromes of medulla and pons

- specific clinical features due to lateral structures:

1. **Tr. spinothalamicus** → (contralateral)\* loss of pain-temperature sensation in ***trunk*** and ***extremities***.
2. **Nucl. sensorii of CN5** (descend from midpons to C3) → (ipsilateral)\* loss of cutaneous sensation in ***face***: \*i.e. crossed sensory loss

nucl. pontinus (pons) – touch;

nucl. spinalis (medulla) – pain and temperature (hypalgesia, thermoanesthesia, corneal hypesthesia).

1. **Tr. reticulospinalis** (descending sympathetic fibers from hypothalamus) → (ipsilateral) Horner’s syndrome.
2. ***Vestibular connections*** → vertigo, nystagmus, nausea, vomiting.
3. ***Cerebellar connections*** (inferior / middle / superior cerebellar peduncles) → (ipsilateral) limb ataxia, asynergia, intention tremor.
4. Hiccup – unclear cause.

No plegia, no loss of touch-proprioception!

The only contralateral sign - loss of pain-temperature sensation in ***trunk*** and ***extremities***.

Pažeidimo aukštį nurodo įtraukti nervai:

Lateral superior pontine syndrome – superior cerebellar artery (SCA):

**Lateral lemniscus** → partial hearing loss.

* vertigo is less common.
* in lesions at and above superior pons (lesion of **trigeminal lemniscus**) – sensory loss in face becomes contralateral (as in rest of body), i.e. sensory loss is no longer crossed.

Lateral inferior pontine (s. **Marie-Foix**) syndrome – anterior inferior cerebellar artery (AICA):

1. **Pontine gaze center** → paralysis of horizontal gaze to side of lesion.
2. **CN7** → (ipsilateral) facial paralysis
3. **CN8** → (ipsilateral) tinnitus, deafness

+ crossed hypesthesia (ipsilateral face loss of touch / contralateral body hypalgesia-thermoanesthesia)

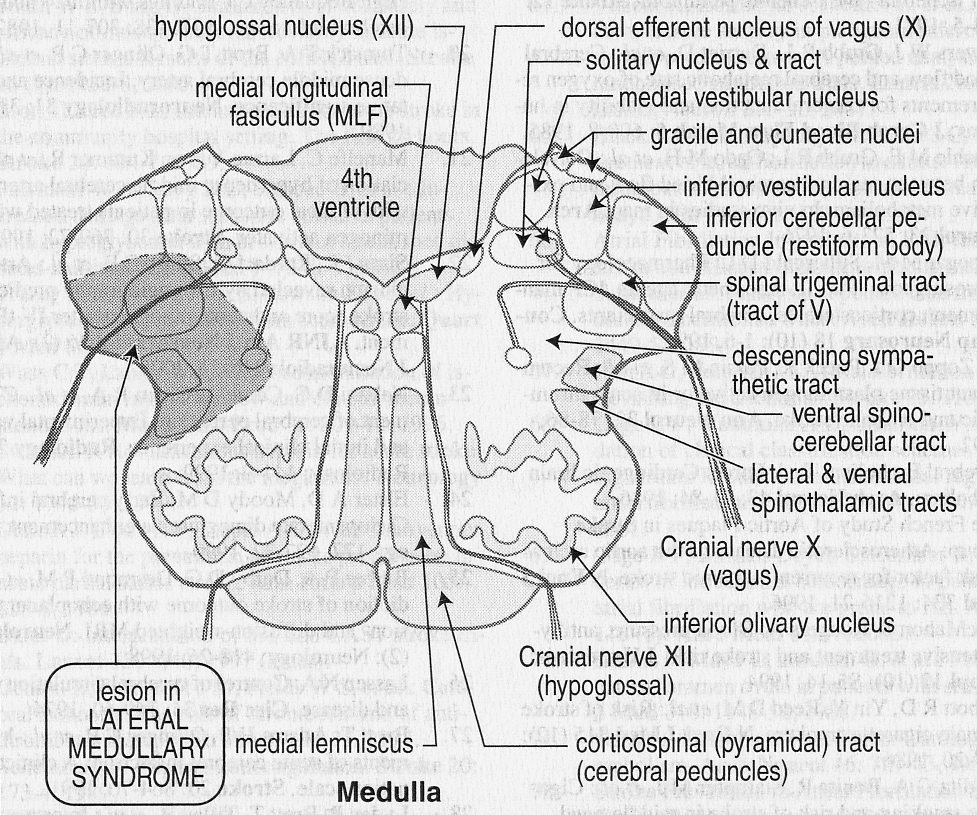
Lateral medullary (s. **Wallenberg**) syndrome – posterior inferior cerebellar artery (PICA) (in 80-85% cases also vertebral artery – exclude VA dissection):

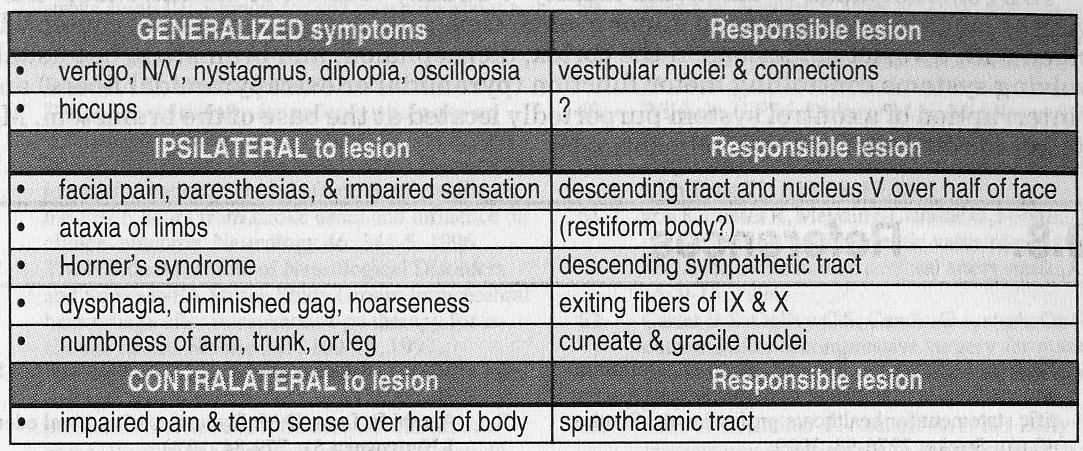
1. **Nucl. tractus solitarii** (CN7) → (ipsilateral) loss of taste.
2. **CN9**, **CN10** → dysphagia, dysarthria, etc.

+ crossed\* hypalgesia-thermoanesthesia (ipsilateral face / contralateral body)

\*this is essentially the only location where lesion will produce crossed sensory loss

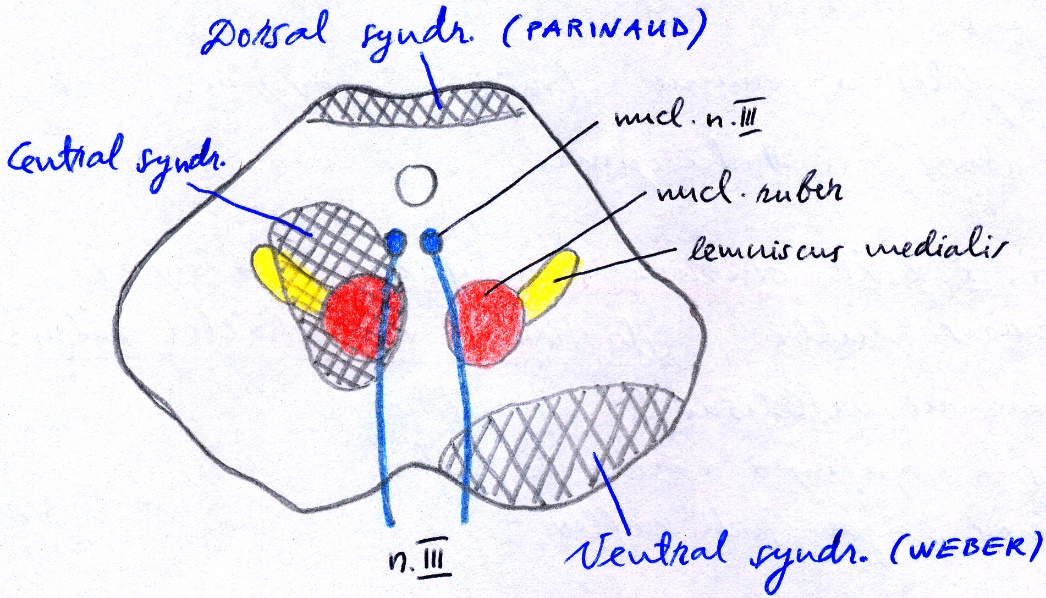
Absence of pyramidal tract findings + no change in mental status





Midbrain syndromes

Išskiriami trys pagrindiniai sindromai:



Dorsal midbrain (s. midbrain pretectal, collicular, **Parinaud**) syndrome – lesion of **pretectal area**, **superior colliculi** (e.g. compression from above by pineal mass; PCA infarct) → supranuclear paralysis of conjugate upward gaze → downward eye deviation (rarely, if unilateral → skew deviation);

+ *Collier sign* (pathological lid retraction) with *Bell phenomenon* (on attempt to close eyes, eyeball rolls up), *mydriasis*, *anisocoria*, *light-near dissociated pupils*, *defective convergence*, *convergence-retraction nystagmus*. [further see p. Eye64 >>](http://www.neurosurgeryresident.net/Eye.%20Ophthalmology\Eye64.%20Gaze%20and%20Autonomic%20Innervation%20Disorders.pdf#Parinaud_syndrome)

Ventral midbrain (s. **Weber**) syndrome - paramedian PCA branches to midbrain - variant of alternating hemiplegia:

1. **Tr. pyramidalis** → (contralateral) hemiplegia, incl. supranuclear CN7 palsy.
2. Ipsilateral emerging **CN3** fibers.

Central (s. tegmental) midbrain syndrome

1. **CN3** nucleus
2. **Medial lemniscus**, **tr. spinothalamicus** → (contralateral) hemianesthesia
3. **Nucl. ruber**, **subst. nigra** → (contralateral) hemichorea, hemiparkinsonism.

* if bilateral (**rostral RF** – ARAS) → coma.

Eilė papildomų sindromų: [further see p. Eye64 >>](http://www.neurosurgeryresident.net/Eye.%20Ophthalmology\Eye64.%20Gaze%20and%20Autonomic%20Innervation%20Disorders.pdf#CN3_syndromes)

1. **Claude syndrome**
2. **Benedikt** **syndrome**
3. **Nothnagel** **syndrome**

Bibliography for ch. “Brain Stem” → follow this [link >>](http://www.neurosurgeryresident.net/A.%20Neuroscience%20Basics\A.%20Bibliography.pdf)

NMS Surgery 2000, Medicine 2000, Pediatrics 2000, Emergency Medicine 1997, Neuroanatomy 1998, Radiographic Anatomy 1990, Physiology 2001

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