

SOMESTHETIC SYSTEM

Sensory receptors. Sensory pathways. Examination of sensation. Patterns of sensory loss.

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Sensory receptors:

1. Mediating superficial sensation (exteroceptors):

- temperature (warmth and cold),**
- touch,**
- pain.**

2. In the deeper somatic structures (proprioceptors):

- vibration sense,**
- kinesthetic sense,**
- sense of pressure.**

Discriminative Sensory Functions

Two-Point Discrimination

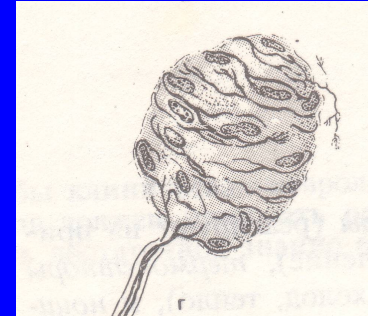
Cutaneous Localizations

Figure Writing (Graphesthesia)

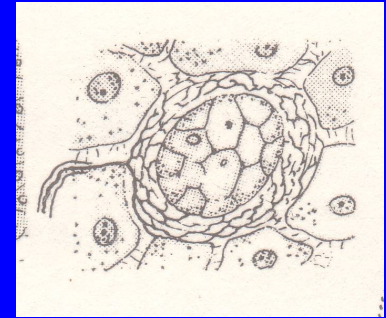
**Appreciation of Texture, Size, and Shape
(stereoesthesia)**

Sensory receptors: histological classifications

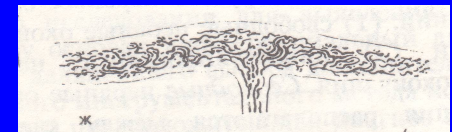
Meissner corpuscles – touch



Merkel discs – pressure

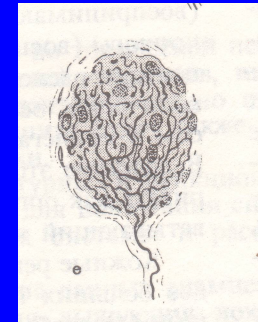


Ruffini plumes - heat

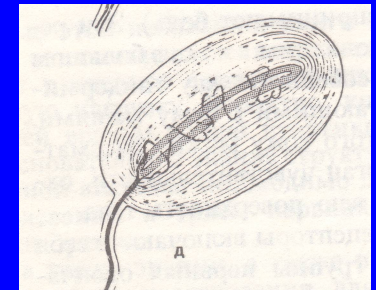


Sensory receptors: histological classifications

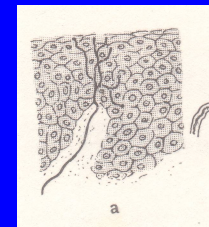
Krause end bulbs – cold



Vater-Pacinian corpuscles –
vibration and tickle

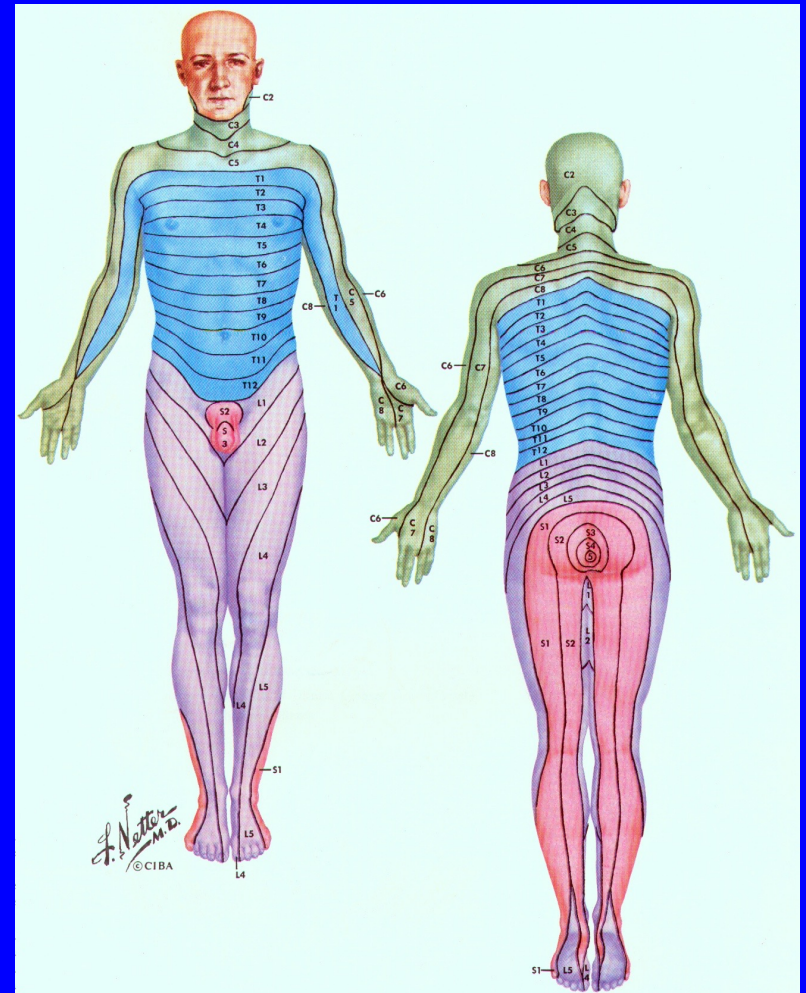
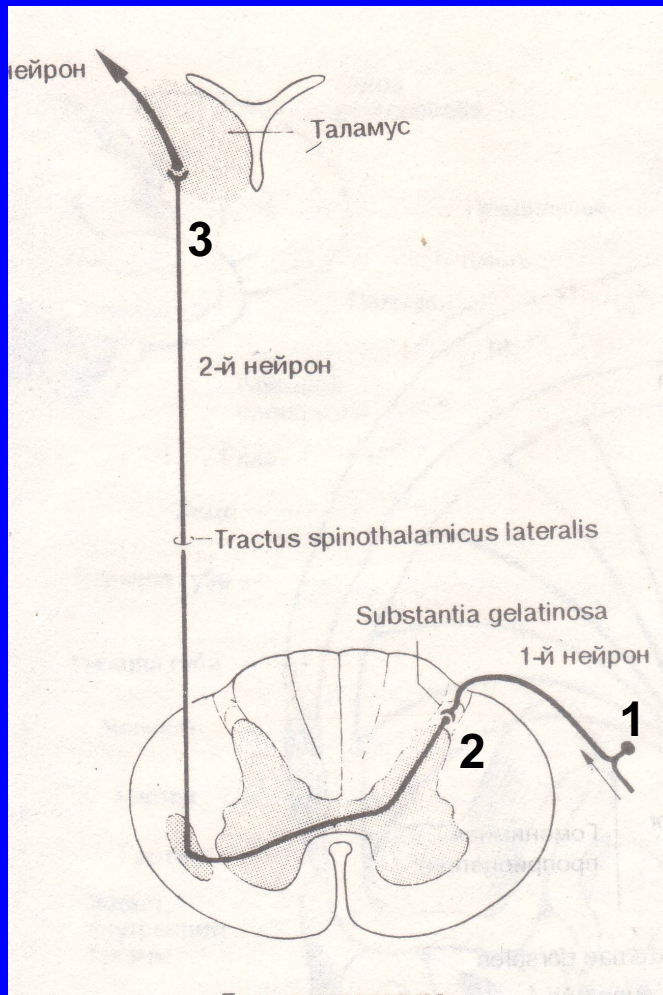


Freely branching endings - pain



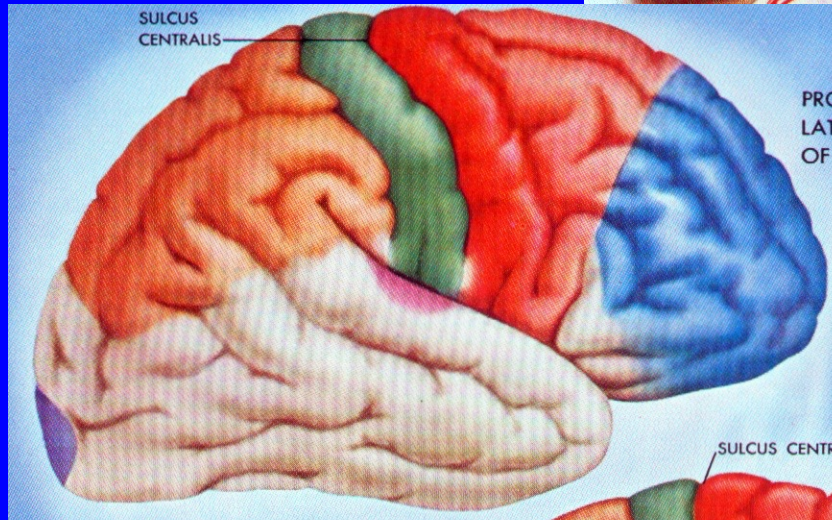
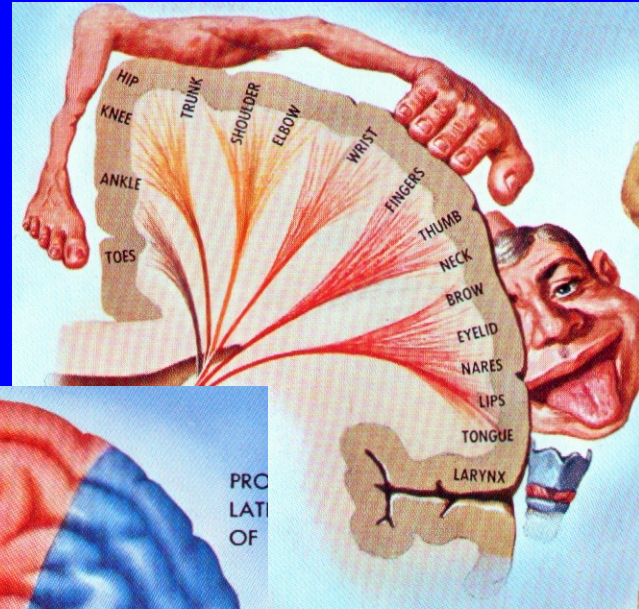
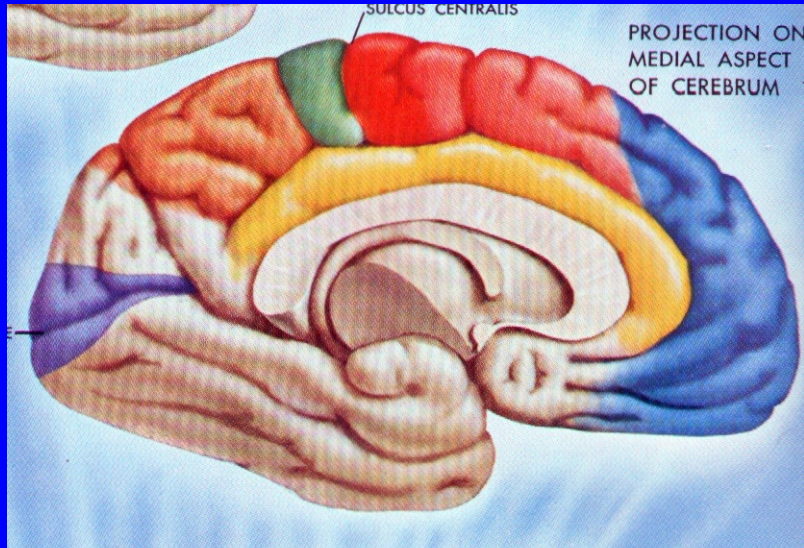
Sensory Pathways

Superficial sensation (pain and temperature)



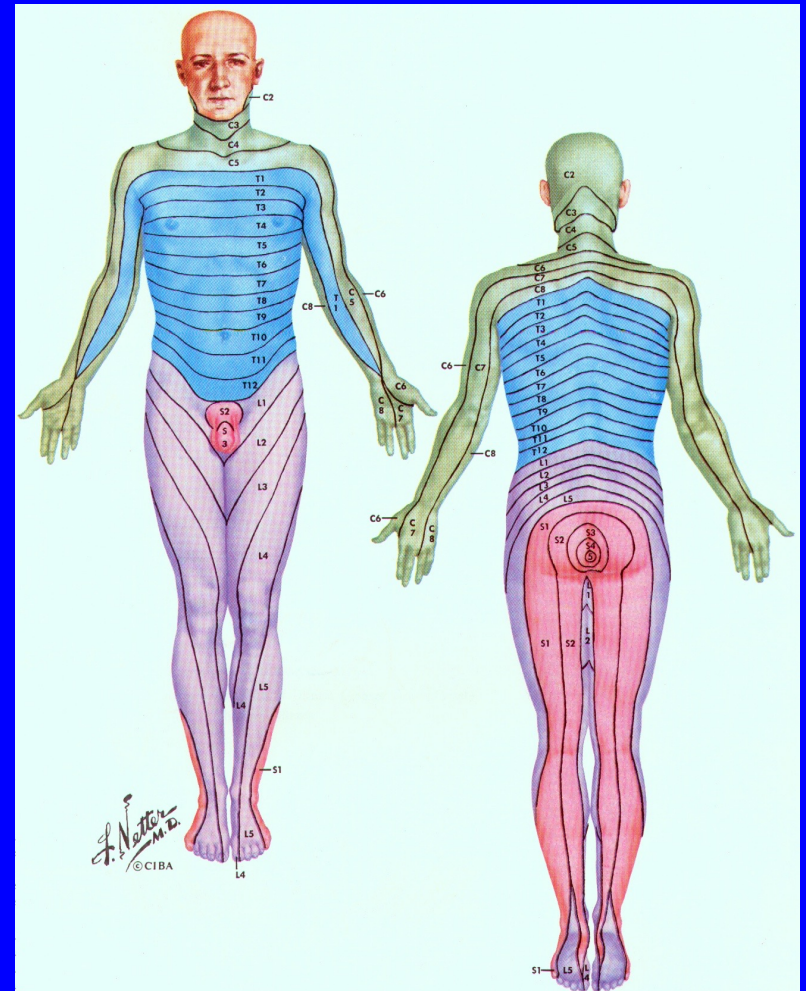
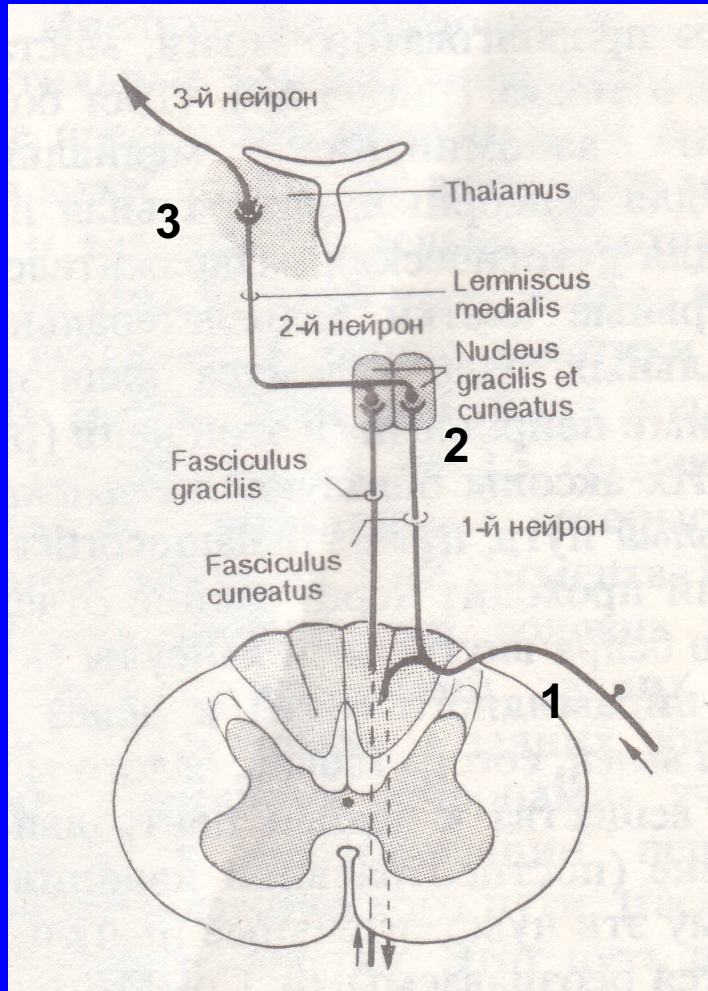
Sensory Pathways

Superficial sensation



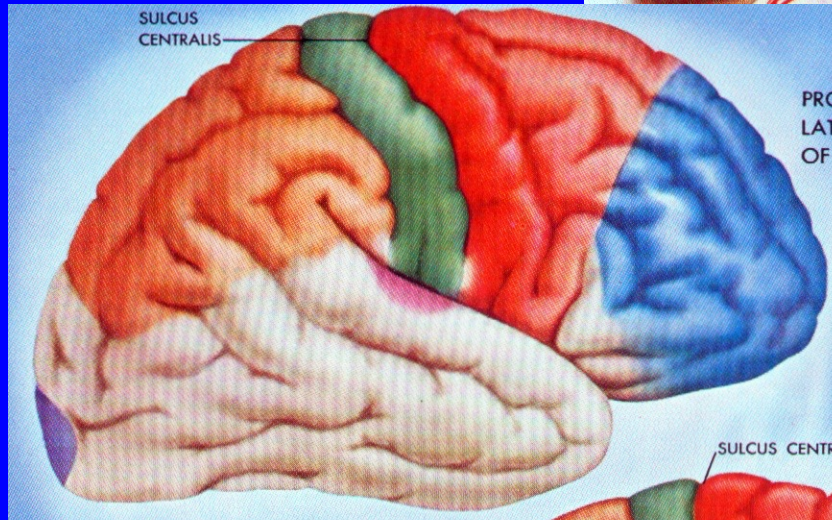
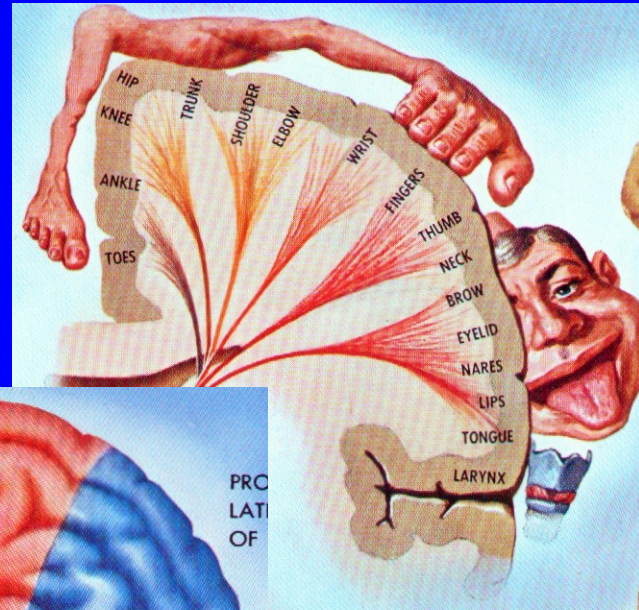
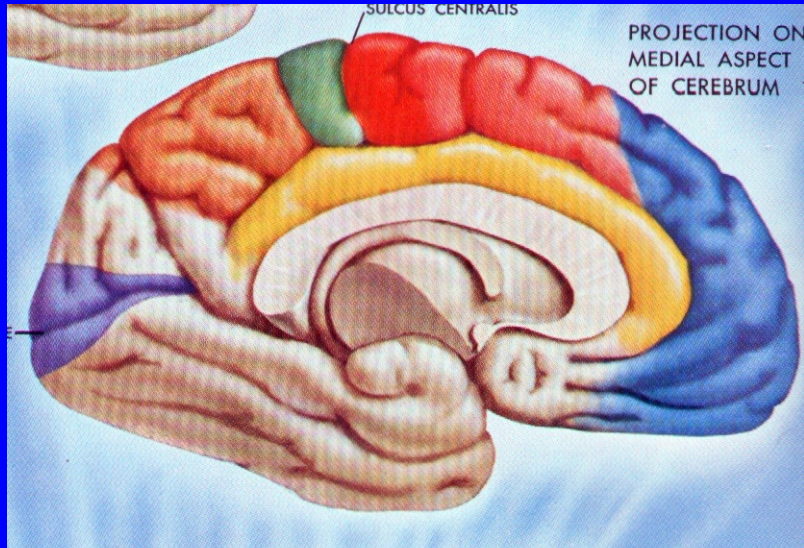
Sensory Pathways

Deep sensation (vibration sense, joint position sense etc.)



Sensory Pathways

Deep sensation



Sensory Pathways

Summary

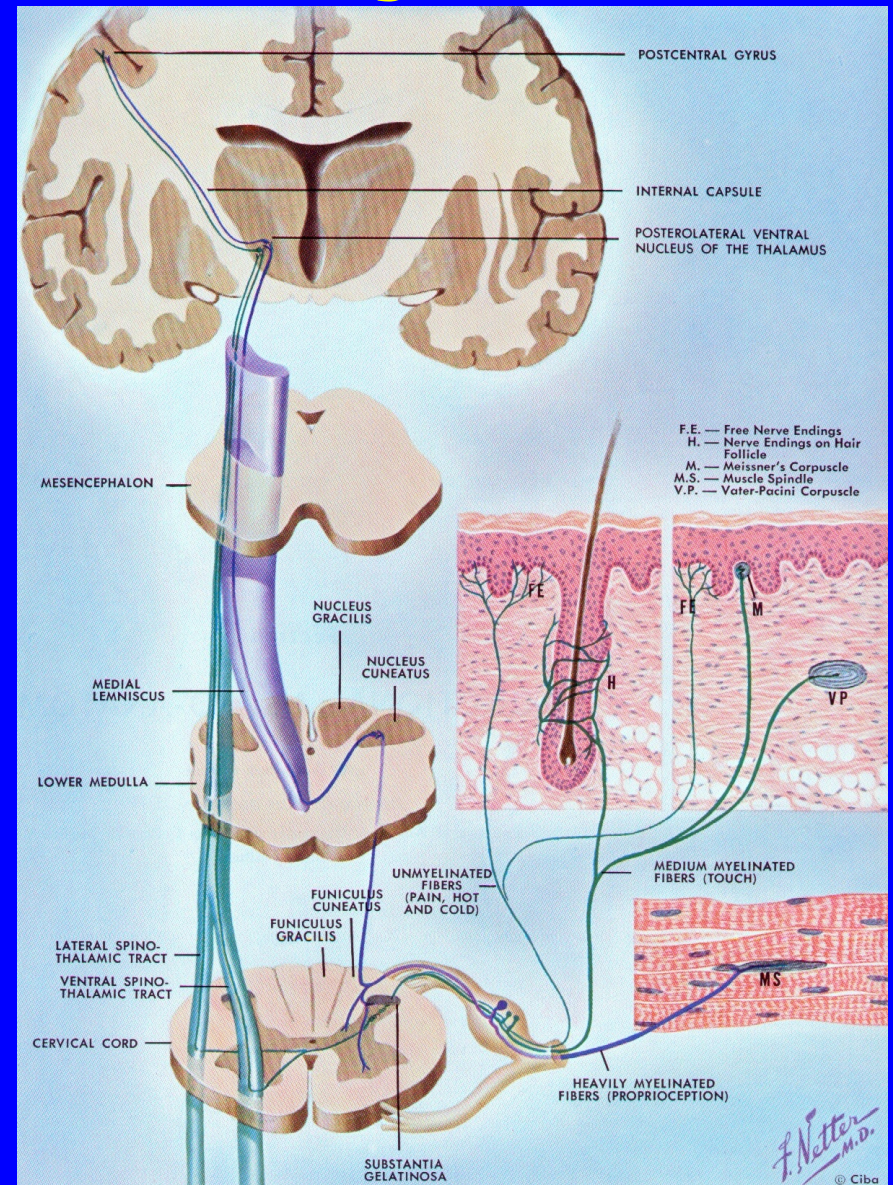
3-neurons chain

1st cell body in the dorsal root ganglia

Crossing after the cell body of 2nd neurons

3rd cell body in the posterolateral ventral nucleus of the thalamus

Cortical sensory area is just behind Rolandic sulcus



EXAMINATION OF SENSATION

Axioms:

Patient must close the eyes

A stimulus must be applied directly on patient's skin

Rules:

1. Cranial - caudal
2. Symmetrical
3. Proximal – distal
4. Limbs: by circumference

DEMONSTRATE – TEST - CHECK

SENSORY LOSS

Sensory symptoms:

Paresthesias (tingling, prickling, “like Novokain”, burning or cutting pain etc.)

Anesthesia (complete loss of all forms of sensation);
pallanesthesia – loss of vibratory sense

Hypesthesia (diminution of sensation –
thermohypesthesia, hypalgesia etc.)

Hyperesthesia

Dysesthesia

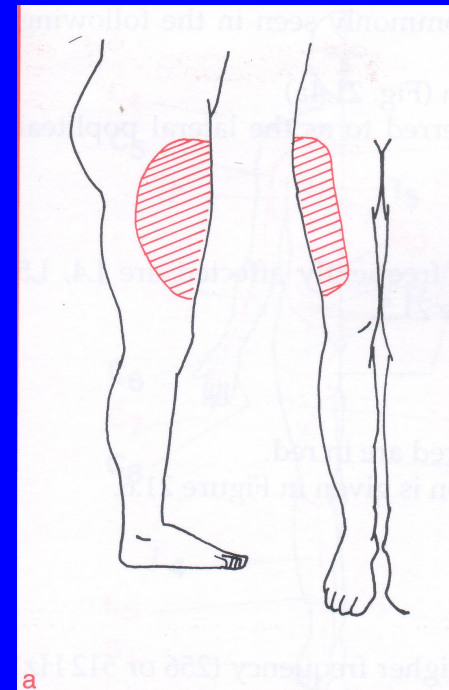
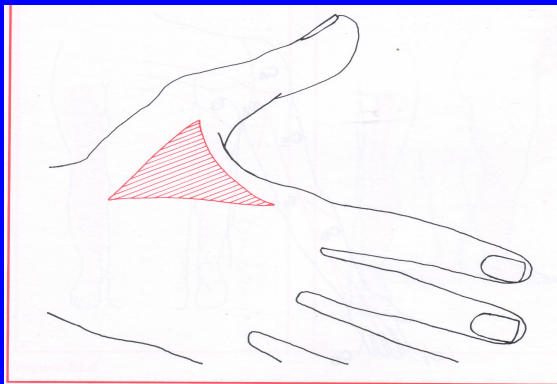
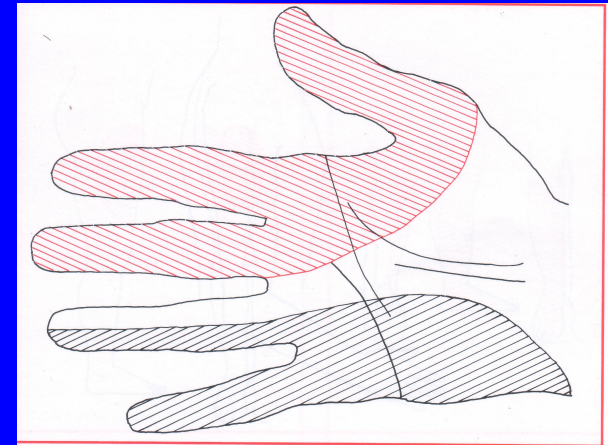
Hyperpathia (severely painful or unpleasant quality)

SENSORY LOSS

Sensory syndromes (patterns):

Peripheral

- mononeural (sensory loss within the distribution of a single nerve)
- multineural (several nerves)



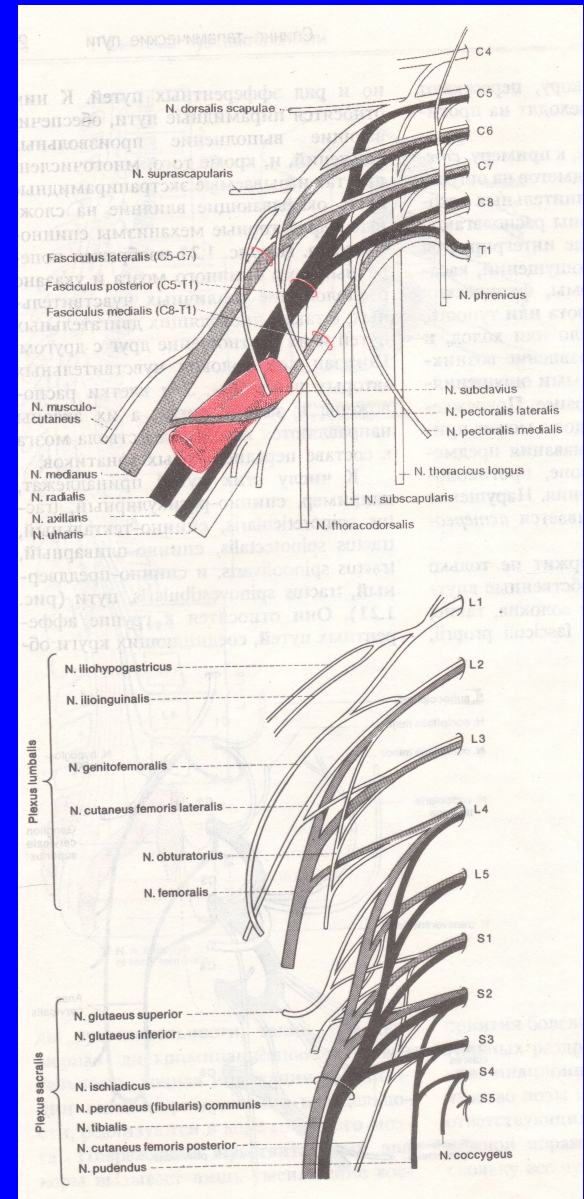
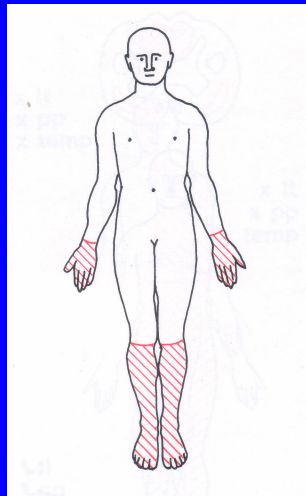
SENSORY LOSS

Sensory syndromes (patterns):

Peripheral

-plexal (sensory loss within
the distribution of a plexus)

-plineural (glove and
socking loss)



SENSORY LOSS

Sensory syndromes
(patterns):

Segmental

-ganglionic (dermal
segment + Herpes
Zoster eruption)

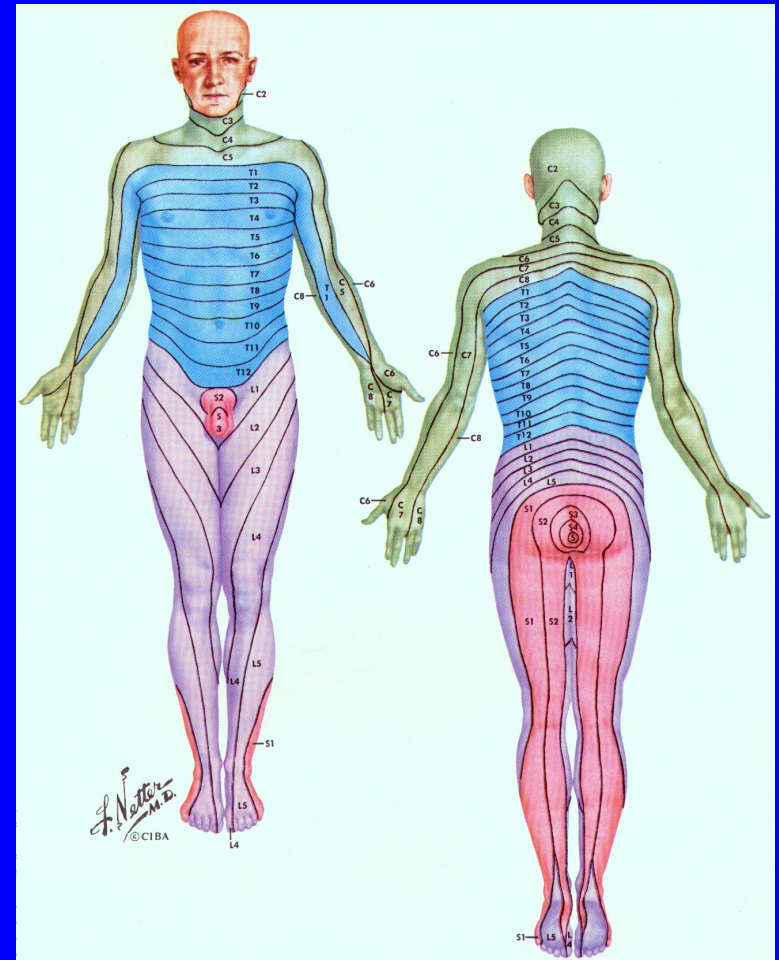


SENSORY LOSS

Sensory syndromes (patterns):

Segmental

- ganglionic (dermal segment + Herpes Zoster eruption)
- radicular (+ elongation signs)
- commissural (loss of pain and temperature, sensation at the level of the lesion, where the spinothalamic fibres cross in the cord)



SENSORY LOSS

Sensory syndromes (patterns):

Conductive

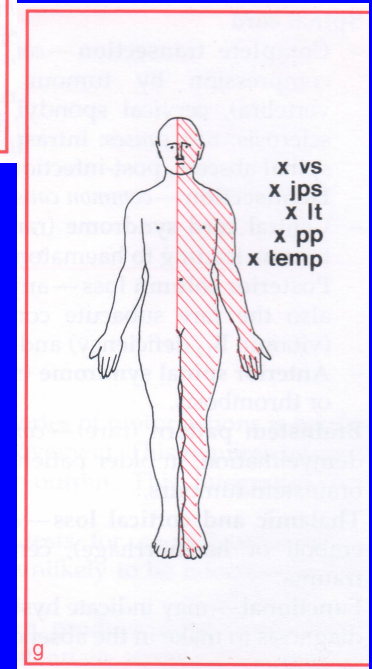
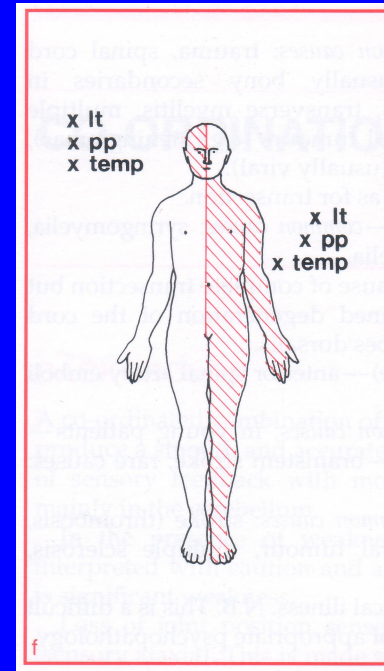
- posterior column loss (loss of joint position sense and vibration sense with intact pain and temperature)
- hemisection of the cord (Brown-Sequard syndrome loss of joint position sense and vibration sense on the same sides as the lesion and pain and temperature on the opposite side a few levels below the lesion)
- complete transverse lesion (loss of all modalities a few segments below the lesion)

SENSORY LOSS

Sensory syndromes (patterns):

Conductive

- Brainstem: loss of pain and temperature on the face and on the opposite side of the body
- Thalamus: hemisensory loss of all modalities + hyperpathia
- Capsula Interna: 4 hemi: anesthesia, plegia, ataxia, anopsia



SENSORY LOSS

Sensory syndromes (patterns):

Cortical (parietal lobe: the patient is able to recognize all sensation but localizes them poorly – loss of two-point discrimination, astereognosis, sensory inattention)

Functional (this diagnosis is suggested by a non-anatomical distribution of sensory deficit frequently with inconstant findings)

SENSORY LOSS

What it means

- **Single nerve lesion** — *common cause*: entrapment neuropathy.

More common in diabetes mellitus, rheumatoid arthritis, hypothyroidism. May be presentation of more diffuse neuropathy.

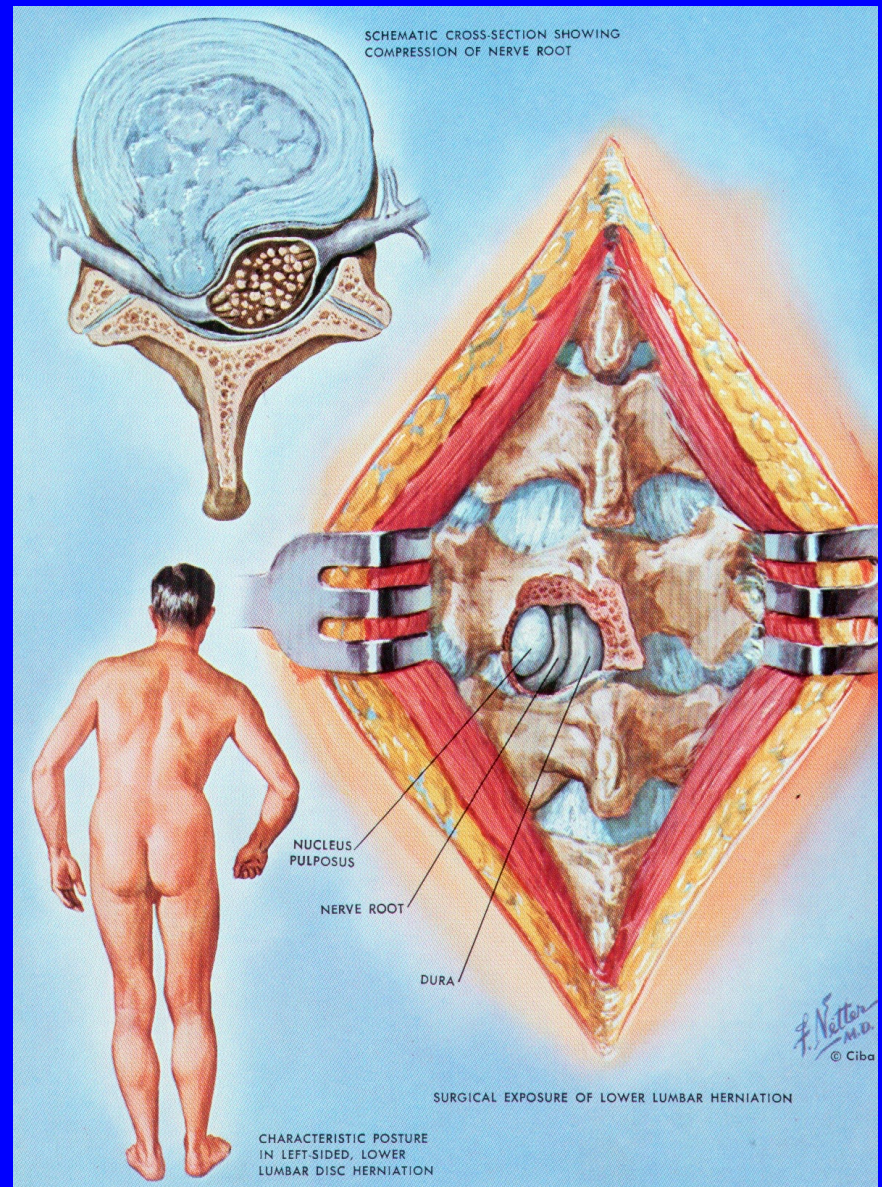
- **Multiple single nerve lesions**: mononeuritis multiplex — *common causes*: vasculitis, or presentation of more diffuse neuropathy.

- **Peripheral nerve lesion** - *common causes*: diabetes mellitus, alcohol-related vitamin B12 deficiency, drugs (e.g. vincristine); frequently no cause is found; *rarer causes*: Guillain-Barre syndrome, inherited neuropathies (e.g. Charcot-Marie-Tooth disease), vasculitis, other vitamin deficiencies.

SENSORY LOSS

What it means

-**Single root lesion** —
common causes:
compression by prolapsed
intervertebral discs; *rare*
causes: tumors (e.g.
neurofibroma).



SENSORY LOSS

What it means

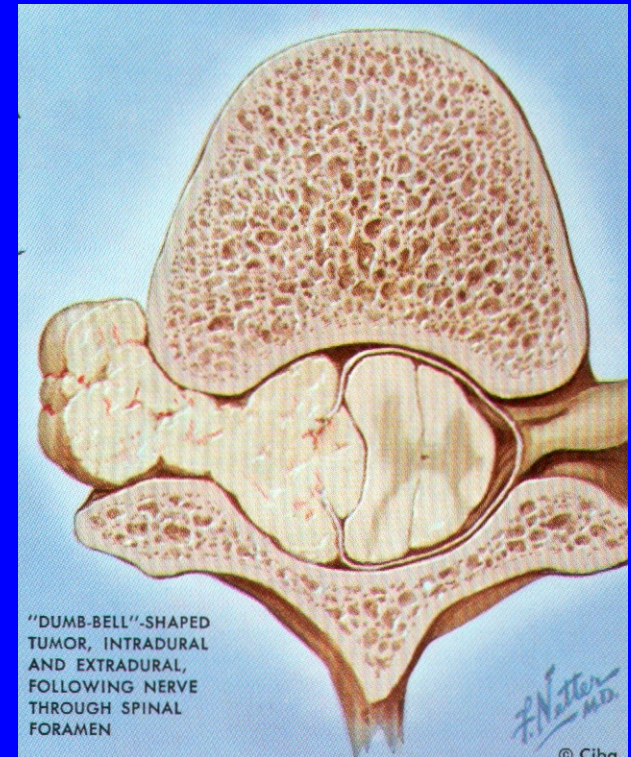
- Spinal cord

- Complete transection—

common causes: trauma, spinal cord compression by tumour (usually bony secondaries in vertebra), cervical spondylitis, transverse myelitis, multiple sclerosis; *rare causes:* intraspinal tumours (e.g. meningiomas), spinal abscess, post-infectious (usually viral).

- Hemisection — *common*

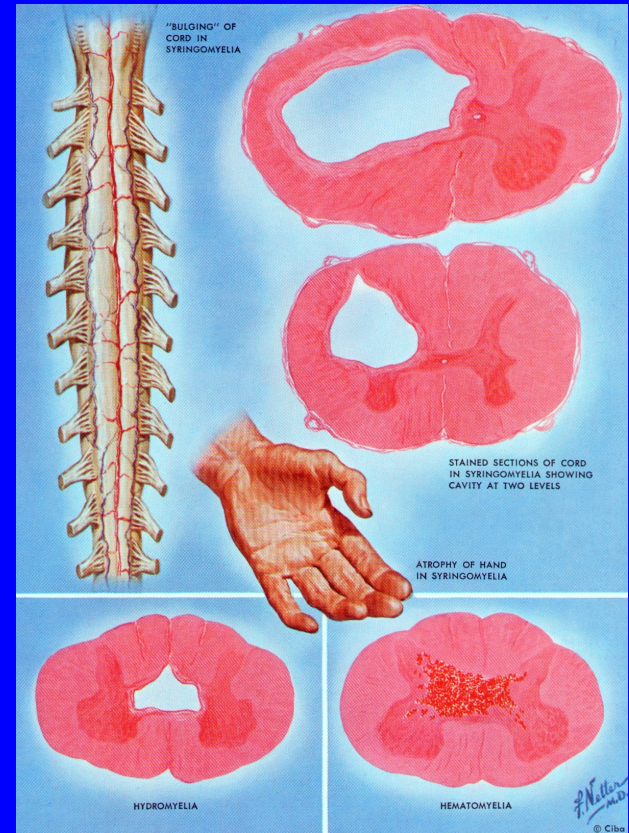
causes: as for transection.



SENSORY LOSS

What it means

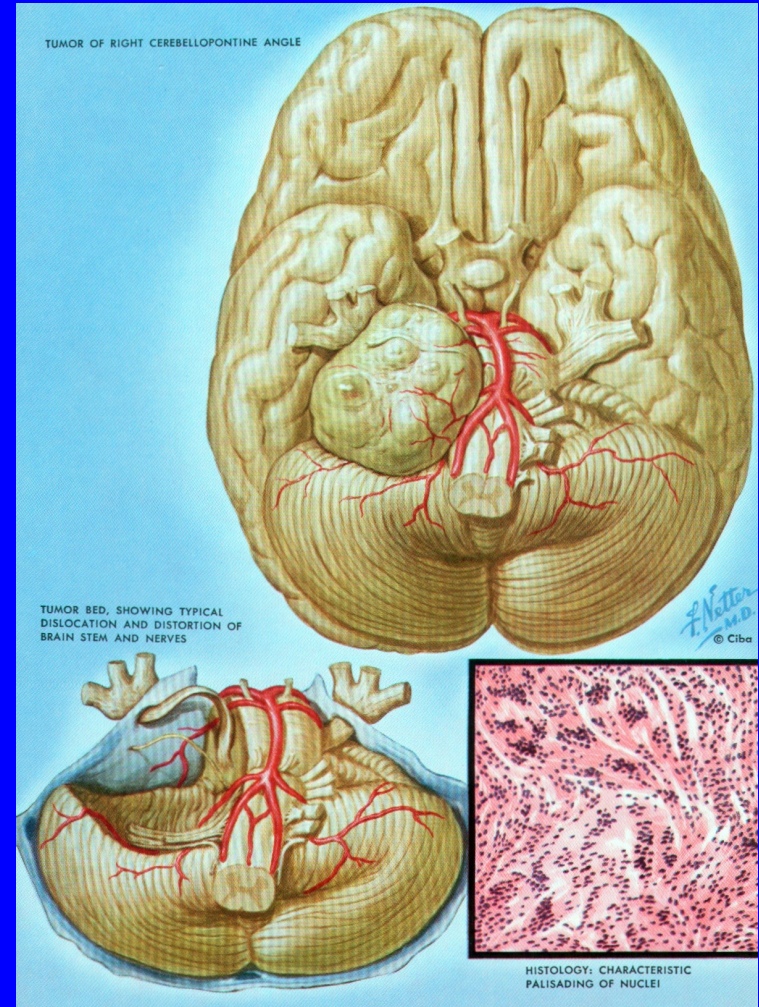
- Spinal cord
 - Central cord syndrome (rare)—*common causes:* syringomyelia, trauma leading to haematomyelia.
 - Posterior column loss — any cause of complete transection but also the rare subacute combined degeneration of the cord (vitamin B12 deficiency) and tabes dorsalis.
 - Anterior spinal syndrome (rare) — anterior spinal artery emboli or thrombosis.



SENSORY LOSS

What it means

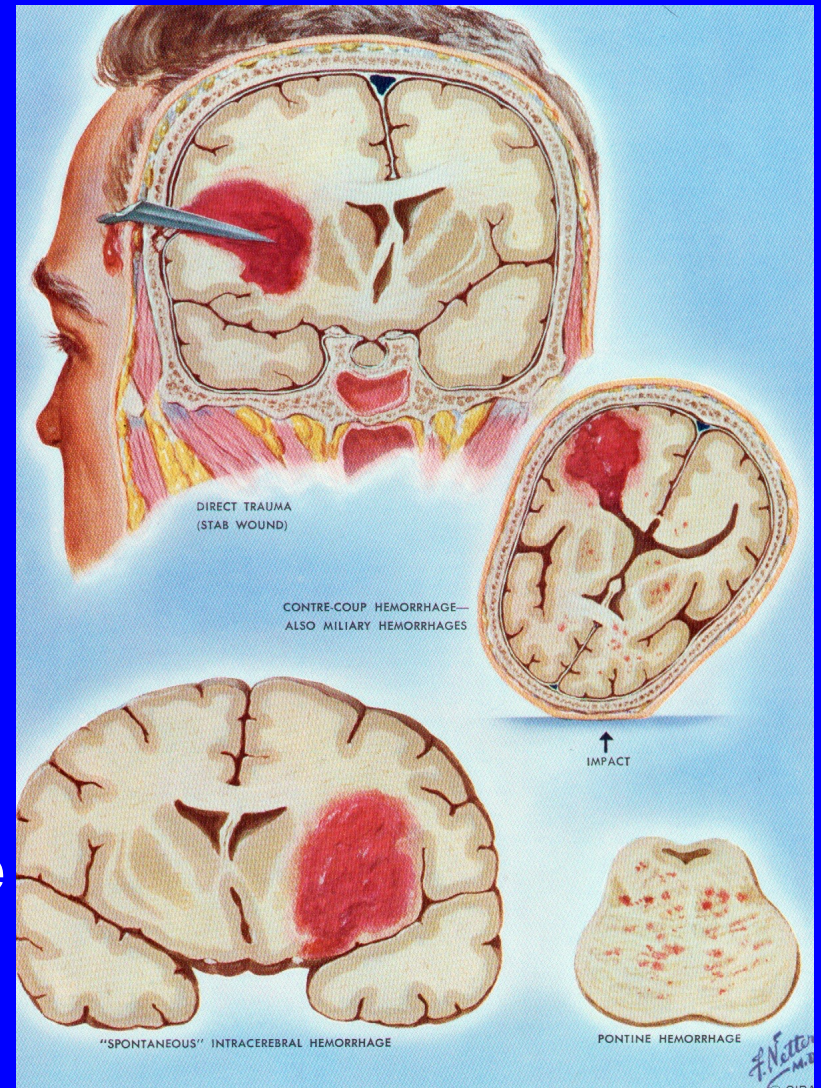
- Brainstem pattern (rare) — *common causes:* in young patients — demyelination, in older patients—brainstem stroke; rare causes: brainstem tumours.



SENSORY LOSS

What it means

- Thalamic and cortical loss—*common causes: stroke (thrombosis, emboli or haemorrhage), cerebral tumour, multiple sclerosis, trauma.*
- Functional—may indicate hysterical illness. N.B. This is a difficult diagnosis to make in the absence of appropriate psychopathology.



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