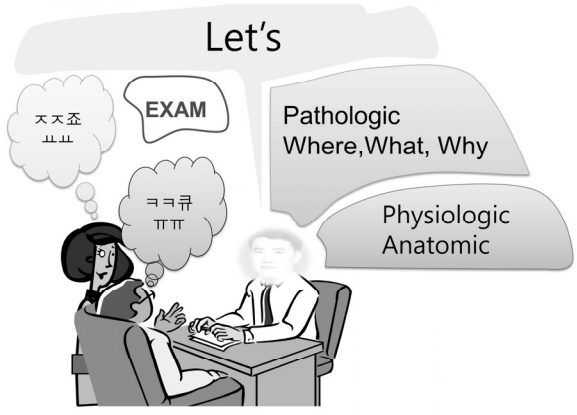
신경학적 진찰1(총론)

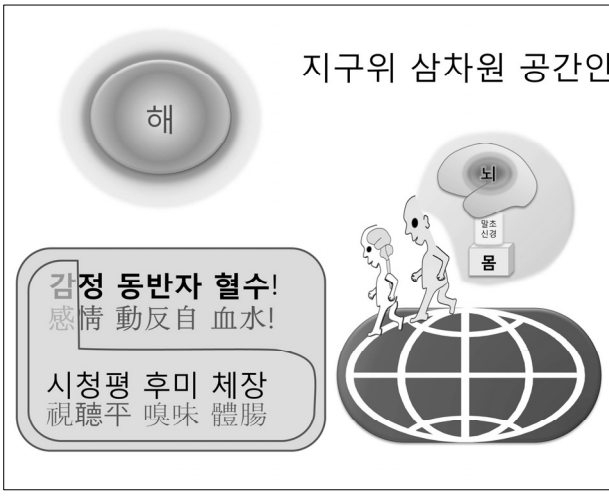
삼성서울병원
서대원

747 전법
Neurological Examination

천안 상록리조트
2017.03.03(금) 9:10~10:10
[대한신경과학회]전공의 입문교육

Practice





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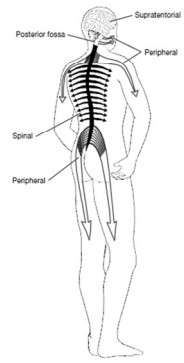
Functional and Structural Anatomy

7 Longitudinal Systems
- Consciousness
- Sensory
- Motor
- Reflex
- Autonomic
- Vascular
- CSF

감정동반자얼수



4 Anatomical Levels
- Supratentorial
- Posterior fossa (infratent)
- Spinal cord
- Peripheral nerve

상하코너

Medical Neurosciences

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7 Longitudinal Systems
Consciousness, Cerebrospinal fluid, Vascular
Motor, Sensory, Reflex, Autonomic

정확한 정보 입력(감각)과 적절한 운동 출력(움직임)

기능: 感情 動 反自 血水!

자율신경계

기타: 혈관계, 뇌척수액계

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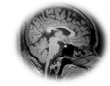
4 Anatomical Levels
Supratentorial, Posterior fossa
Spinal cord, Peripheral nerve



천막 상부

Supra tento

구조: 상하코너 上下CORNER

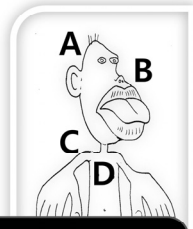
근육

An: 상하코너

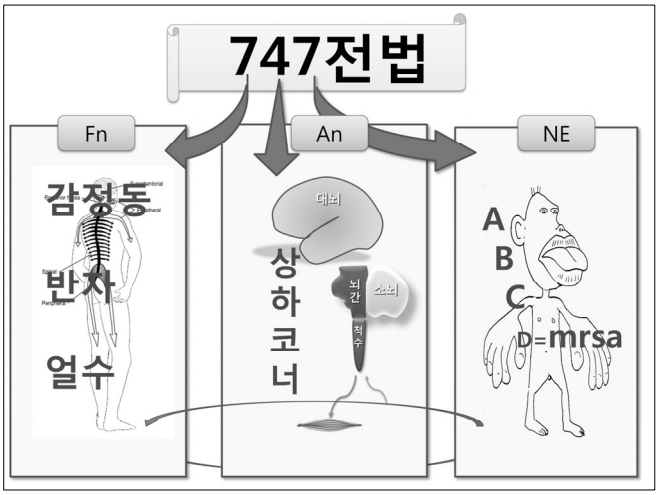
서대원. 하기 쉬운 신경유발전위검사와 수술중 신경계감시. 군자출판사 2011

7 Subdivisions in N/E

A. Arousals Awareness (mental status)
B. Brainstem (cranial nerves)
C. Cervical (neck)
D. Distal
M) Motor (+coordination and gait)
R) Reflexes
S) Sensory



진찰: ABCDmrsa



Considerations before NE

- Detail health history
  - Potential and actual health problems
- Check tools
  - Put on the gown, Wash hands and warm
- Explain the assessment process and answer questions
  - Drape the patient appropriately and Instruct the position

- Assess head to toe and both sides of the body
- Document your findings

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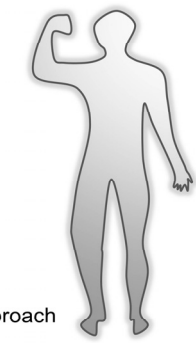
Steps in Neurological Examination

Basic plan
- General examination
- A: Conscious state
- B: Cranial nerves
- C: Meningeal signs
- D: Motor, Reflex, Sensory, plus

Don't do everything
Screening tests of all systems
Detailed tests by problem oriented approach



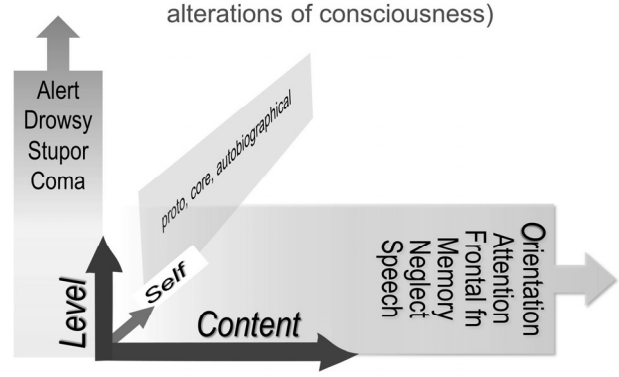
NE according to Seven Subdivisions

A. Arousals Awareness (mental status)
B. Brainstem (cranial nerves)
C. Cervical (neck)
D. Distal
- Motor (+coordination and gait)
- Reflexes
- Sensory
- Autonomic

plus CSF, Vascular

Mental Status Examination (MSE)

(modern three-dimensional framework for alterations of consciousness)



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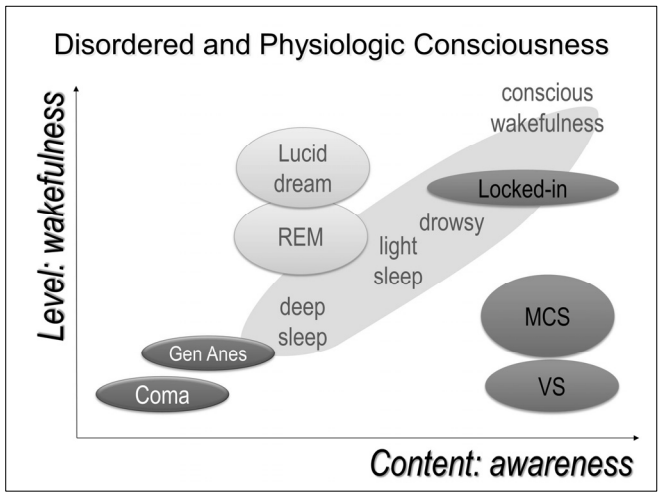
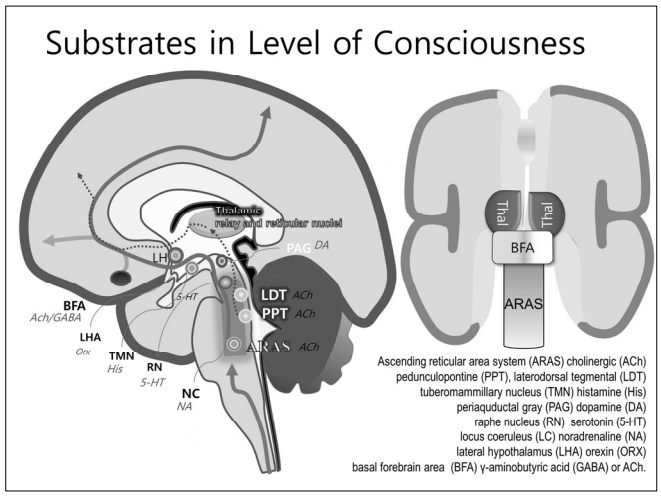
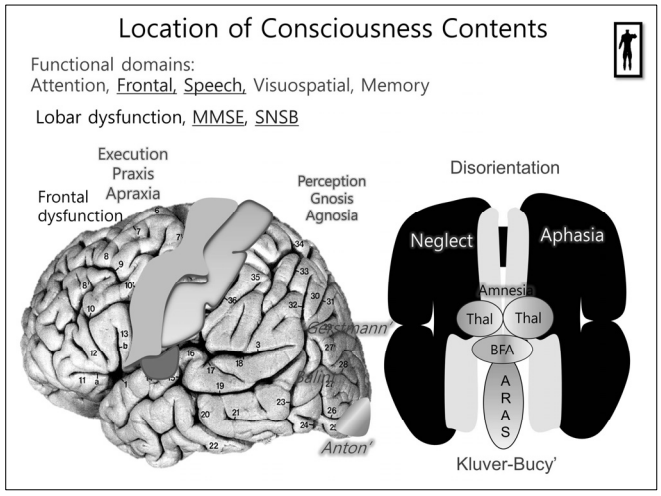
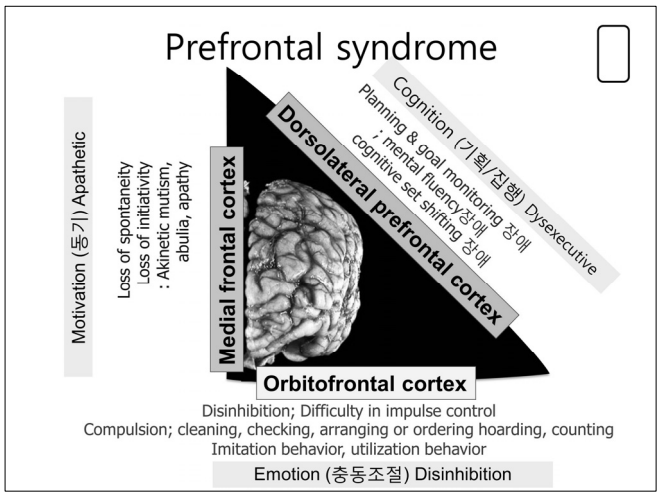
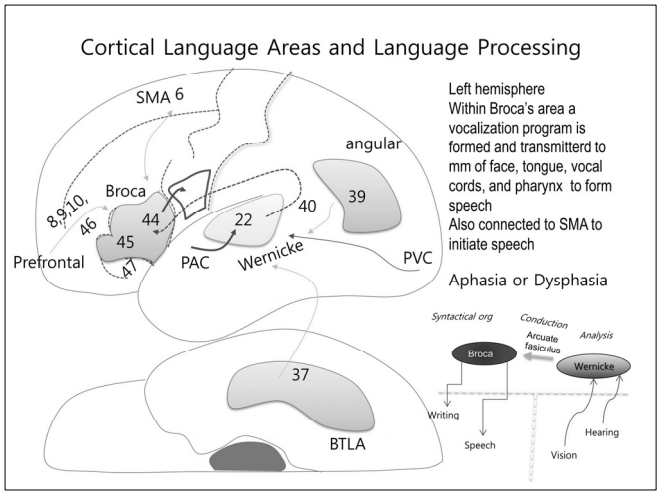

Disordered and Physiologic Consciousness
Level: wakefulness
Content: awareness
conscious wakefulness
Lucid dream
REM
Locked-in
drowsy
light sleep
deep sleep
Gen Anes
Coma
MCS
VS


Substrates in Level of Consciousness
Thalamic relay and reticular nuclei
LH
PAG DA
LDT ACh
PPT ACh
ARAS ACh
5-HT
BFA
Ach/GABA
LHA
Orx
TMN
His
RN
5-HT
NC
NA
Thal
Thal
BFA
ARAS
Ascending reticular area system (ARAS) cholinergic (ACh)
pedunculopontine (PPT), laterodorsal tegmental (LDT)
tuberomammillary nucleus (TMN) histamine (His)
periaquductal gray (PAG) dopamine (DA)
raphe nucleus (RN) serotonin (5-HT)
locus coeruleus (LC) noradrenaline (NA)
lateral hypothalamus (LHA) orexin (ORX)
basal forebrain area (BFA) γ-aminobutyric acid (GABA) or ACh.


Location of Consciousness Contents
Functional domains:
Attention, Frontal, Speech, Visuospatial, Memory
Lobar dysfunction, MMSE, SNSB
Execution
Praxis
Apraxia
Frontal dysfunction
Perception
Gnosis
Agnosia
Gerstmann
Wallin
Anton'
Disorientation
Neglect
Aphasia
Amnesia
Thal
Thal
BFA
A
R
A
S
Kluver-Bucy'

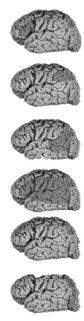
MEMO





Dominant Language Area Dysfunction

Types	Fluency	Repetition	Comprehension
Broca's	-	-	+
Conduction	+	-	+
Wernicke's	+	-	-
Global	-	-	-
Transcortical motor	-	+	+
Transcortical sensory	+	+	-



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K-MMSE

항목		반응	점수
지남력 (시간) [5]	년 (1)		
	월 (1)		
	일 (1)		
	요일 (1)		
	계절 (1)		
지남력 (장소) [5]	나라 (1)		
	시, 도 (1)		
	무엇하는 곳 (1)		
	현재장소 명 (1)		
	몇 층 (1)		
기억등록 [3]	비행기 (1)		
	연필 (1)		
	소나무 (1)		
주의집중 및 계산 [5]	100-7 (1)		
	-7 (1)		

기억회상 [3]	비행기 (1)	
	연필 (1)	
	소나무 (1)	
언어 능력 [8]	이름대기 (2) - 시계, 볼펜 -	
	명령시행 (3) '종이를 뒤집고 (1), 반으로 접은 다음 (1), 저에게 주세요(1)'	
	따라 말하기(1) - '백문이 불여일건' -	
	읽기 (1)	
	쓰기 (1)	
그리기 [1]	오각형 겹쳐 그리기 (1)	
총점	/ 30	

눈을 감으세요.

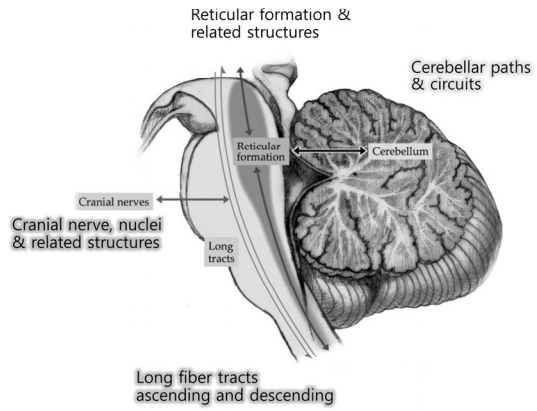
SNSB (Seoul Neuropsychological Screening Battery)

Construction and scoring system for the SNSB-D and modifications from the original SNSB

Domains	Score	%	Subtests	Max.	Modification from original SNSB
Attention	17	6	Digit span forward	9	None
			Digit span backward	8	
Language and related fn	27	9	Short form of K-BNT (A form)	15	Short form instead of the full 60 item version of K-BNT Excluded items: spontaneous speech, auditory comprehension, repetition, reading, writing, four components of Gerstmann syndrome, limb and buccofacial praxis
			Calculation(3 items each for addition ,subtraction, multiplication, division)	12	
Visuospatial fn	36	12	RCFT copy	36	None
Memory	150	50	Orientation	6	Out of 10 orientation items, season, country, city, and floor were excluded
			SVLT free/delayed recalls	48	
			SVLT recognition	12	
			RCFT imm./delayed recalls	72	
			RCFT recognition	12	
Frontal /Executive fn	70	23	Motor impersistence	3	Excluded items: alternating hand movement, alternating square and triangle, category word generation (supermarket), phonemic word generation (ㅇ, ㅅ), Stroop test-word reading
			Contrasting program	3	
			Go-no-go test	3	
			Fist-edge-palm	3	
			Luria loop	3	
			Category word generation (animal)	20	
			Phonemic word generation (ㄱ)	15	
			Stroop test-color reading	20	
GCF score	300	100			

K-BNT, Korean-Boston naming test; RCFT, Rey-complex figure test; SVLT, Seoul verbal learning test; GCF, global cognitive function.

Major Components of Brainstem



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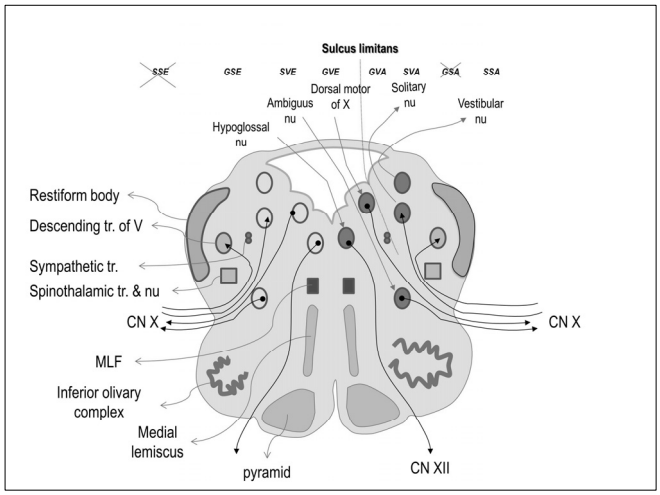
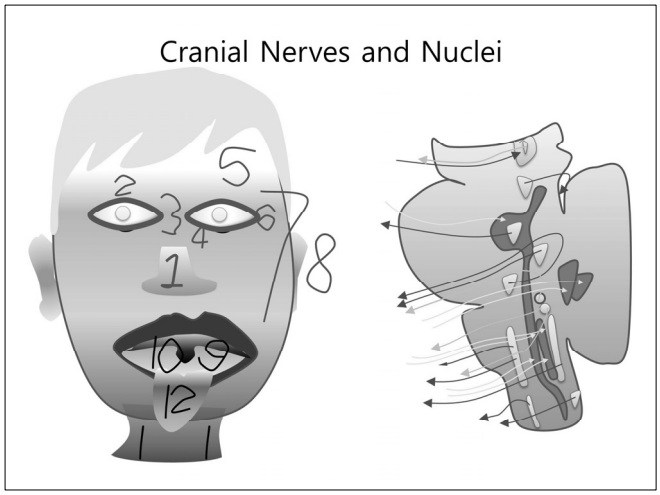
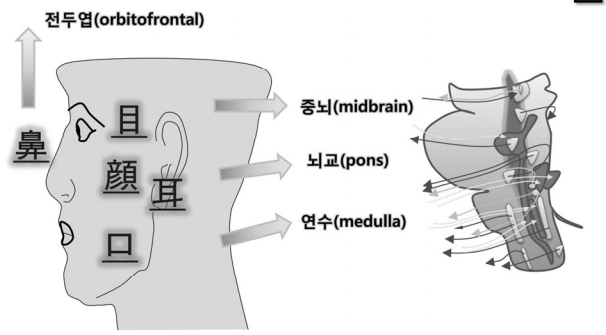




Cranial Nerve Examinations (CNE)

Area	Function
코 鼻	Olfaction
눈 目	Visual acuity (Snellen chart), Visual fields Extraocular motor (eyeball movements) Intraocular motor (pupil size, reflexes) Fundus
안 顔	Facial sensory Facial expression (winkle, wink, whistle)
귀 耳	Hearing Vestibular reflex (oculocephalic reflex)
입 口	Taste Soft palate movement (say ah, gag reflex) Tongue movement Swallowing, Phonation
목 頸	Sternocleidomastoid, Trapezius

얼굴과 뇌간의 대응

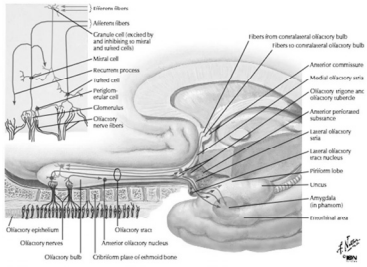


얼굴구조 ⟸ 뇌신경 ⟸ 뇌신경핵

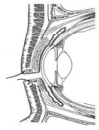
鼻, 코, Nose

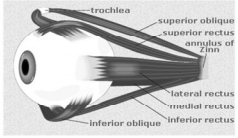
Olfactory
- Cortical input direct (not via thalamus)
- Amydala and limbic system

Stimuli
- Not noxious, irritant
- Coffee, soup



目, 눈, Eyes





- Visual acuity — Pocket visual screening card
- Visual field — Confrontation test
- Extraocular m — SO4 LR6 rest 3
- Pupillary reflex — Light reflex Near reflex
- Fundus exam
- Corneal reflex

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Vision

Visual acuity
- Snellen chart or pocket card
- finger counting
- hand movement
- light perception

Color vision
- 100 hue test

usually ipsilateral
prechiasmal lesion

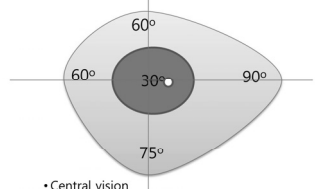
Field

Confrontation Test

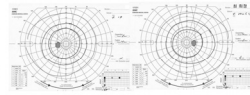
Perimetry
- Goldmann
- Humprey

Mono-ocular exam
- for prechiasmal lesion

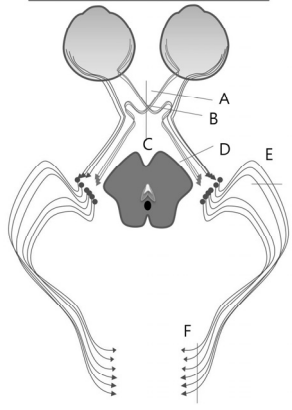
Bi-ocular exam
- for retrochiasmal lesion

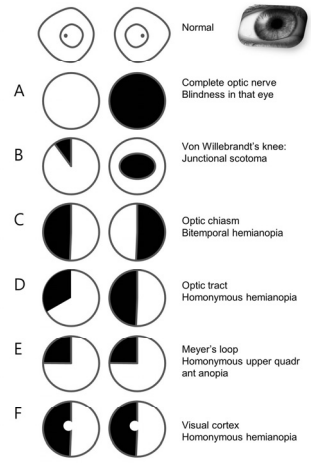


- Central vision
- Peripheral vision
- Blind spot: lat 15°, down 1.5°, in temporal field



Visual field defect





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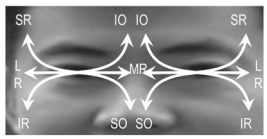
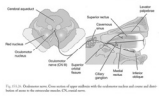
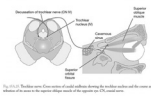
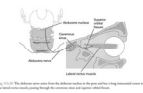
Extraocular Movements

- Tests
  - Primary eye position
  - H movement
  - Convergence
- Ocular excursion
  - Duction EOM action (1st, 2nd, 3rd)
  - Version yoke m
  - Gaze Conjugate: saccade, smooth pursuit, VOR
    Dysconjugate: convergence





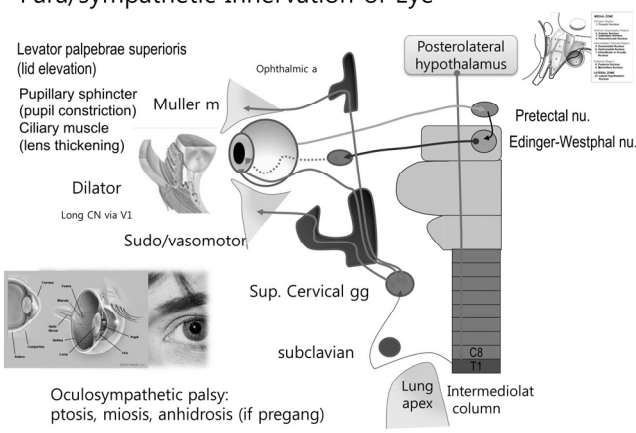




Fixation Abnormalities

- Saccadic oscillation/intrusion
- Nystagmus
  - 1st degree; only when looking in the direction of the quick component
  - 2nd degree; when looking straight ahead
  - 3rd degree; even when looking in the direction of the slow component

Para/sympathetic Innervation of Eye



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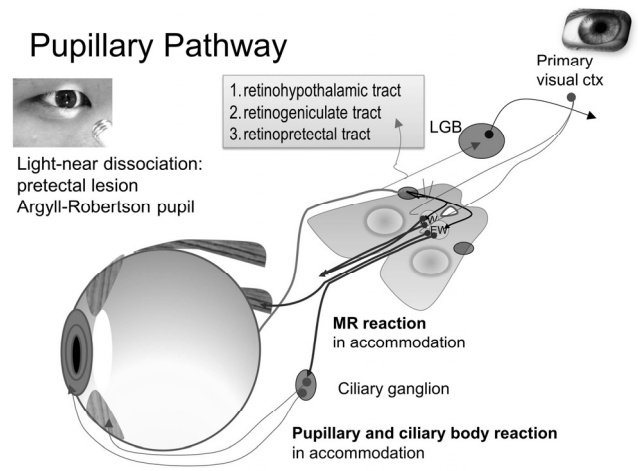
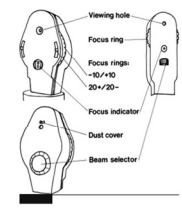
Pupillary Pathway

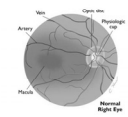


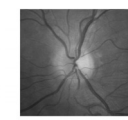
Fundoscopic Exam



- Preparing ophthalmoscope
- On
- Left-left-left (index finger for lens selector)
- Fix the point (look straight ahead, blink 가능)
- 15 inch. Red reflex
- Move toward pt

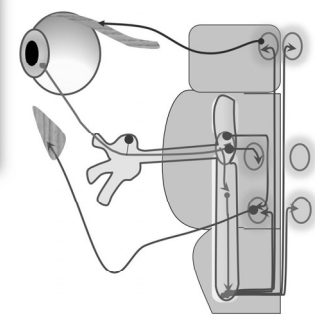
- Tips. Situp straight... Focus...holding forehead





Corneal Reflex

- Throat swab and no blinking should be seen

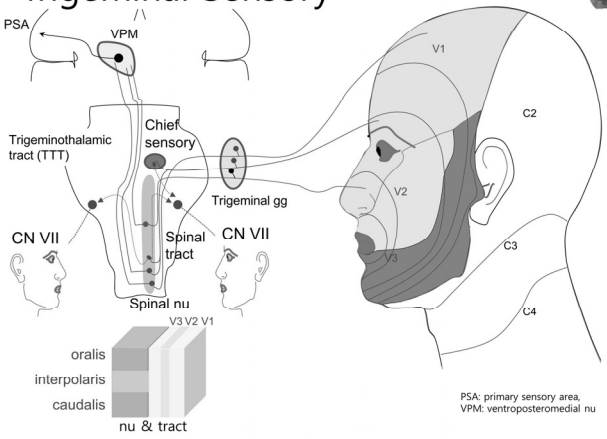


MEMO

顔, 얼굴, Face

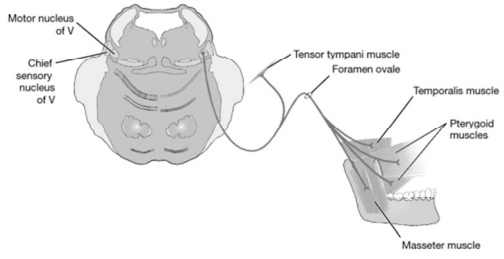
- Sensory
  - V1, V2, V3, External auditory canal
- Motor
  - Vm Mastication
    - Temporalis, Masseter, Med & Lat Pterygoid
  - VII Expression
    - Frontalis, Oculi, Zygomaticus, Oris
- Reflex
  - Jaw jerk

Trigeminal Sensory



Trigeminal Motor

- Motor to muscles of mastication:
  - Temporalis and masseter, medial and lateral pterygoid
- Temporal m examination:
  - Have the patient clench, Note the equality of tension on both



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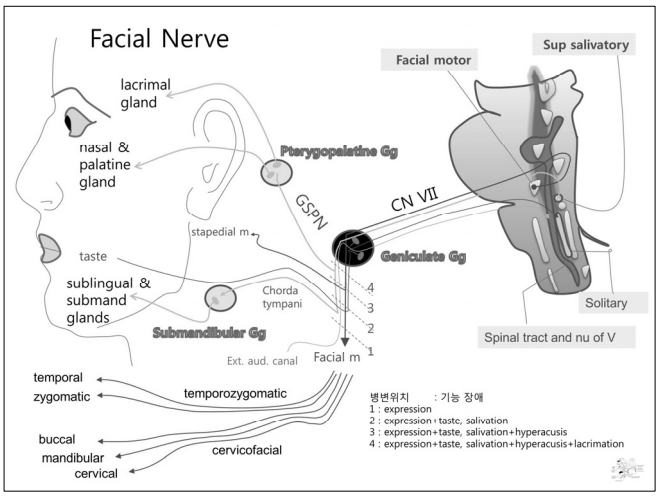
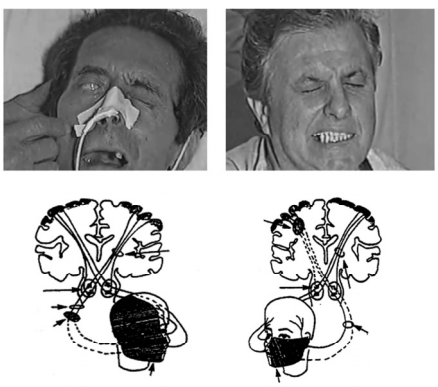


Peripheral vs. Central Facial Palsy



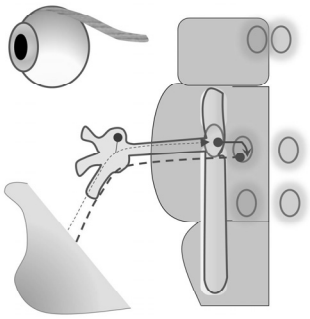
House and Brackmann Facial nerve weakness grading system

Grade	Descriptor	%	Detailed description
1	Normal	100	Normal facial function in all areas
2	Mild dysfn	~75	Symmetry at rest, Asymmetry at motion
3	Moderate	~50	Obvious and not disfiguring asymmetry
4	Mod to severe	~25	Obvious weakness and disfiguring asymmetry
5	Severe	~0	Asymmetry at rest, Incomplete eye closure Only barely perceptible motion
6	Total paralysis	0	No movement

House WF. Facial nerve grading system. Otolaryngol Head Neck Surg 1985;93:184-193

MEMO

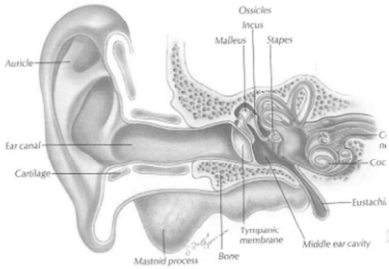
Jaw Jerk

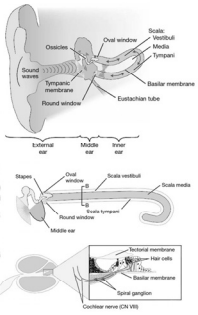


Normally
minor
response

耳, 귀, Ear

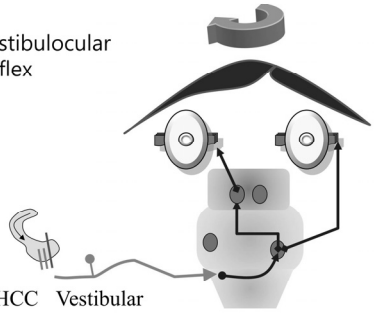
- Vestibulocochlear nerve:
  Balance and Hearing





EAR-Vestibular Reflex

Vestibulocular
Reflex



RHCC Vestibular

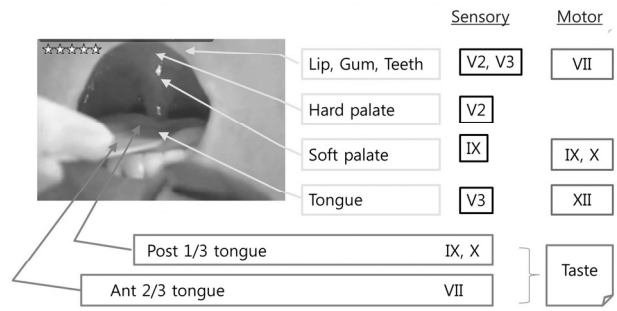
LHCC

Doll's eye (VOR)
Cold (Caloric)

MEMO

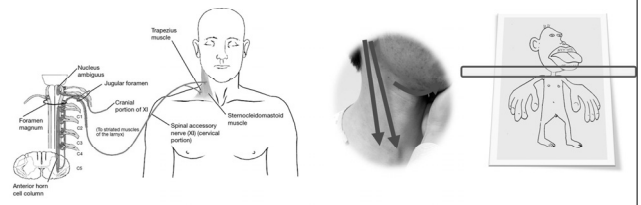
口, 입, Mouth

- Palate, Pharynx, Larynx, Tongue
- Soft palate movement, Phonation, Tongue deviation, Swallowing, Gag reflex, Posterior tongue taste



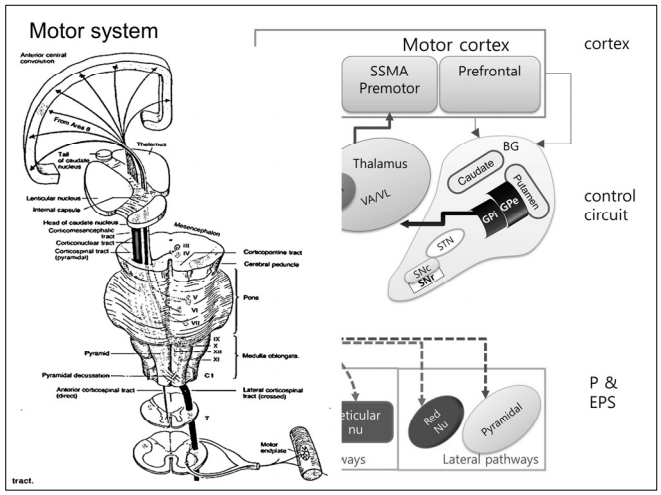
Neck

- Sternocleidomastoid, Trapezius
- Meningeal irritation signs
- Bruits; Carotid
- Lhermitte's sign; Multiple sclerosis



Meningeal Irritation Signs

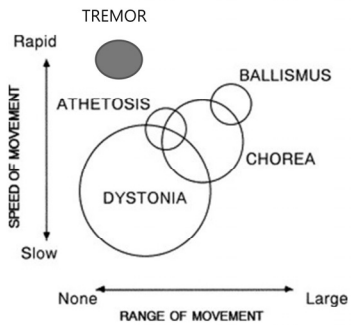
- Neck stiffness
  - Brudzinski, Kernig
  - most frequently found in patients with meningitis, SAH

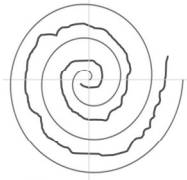


1. Motor Exam

- Inspection — atrophy, fasciculation, involuntary movement
- Tone — spastic, flaccid, rigid
- Power — shoulder abduction, wrist extensor, hip flexor, ankle dorsiflexor
- Coordination — RAM, FTN, HTS
- Station and Gait — Romberg, Tandem

Involuntary Movements



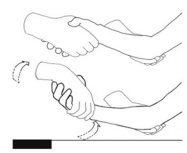


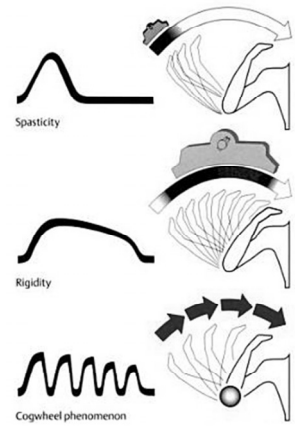
Archimedes spiral

MEMO

MEMO

Tone





Power

Muscle Strength Grading

Grade	Definition
0	no contraction
I	a flicker of contraction, seen or palpated
II	contraction sufficient to move joint horizontal but not against the force of gravity
III	contraction sufficient to maintain a position against the force of gravity
IV	resist the force of gravity + add. force
V	normal motor power

Grades 4 -, 4 and 4+ may be used to indicate movement against slight, moderate and strong resistance respectively

British Medical Research Council Scale of Muscle Strength, 1953

Elbow flexion

Trick movement involves pronation of the arm to use brachioradialis
Elbow extension
Hold the patient's elbow and wrist. Ask him to extend the elbow
- Muscle: triceps
- Nerve: radial nerve
- Root: (C6), C7, (C8).

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Axial Muscle Evaluation

Level	Muscle	Action to test
C4	Diaphragm	TV, FEV1, VC
T2-9	Intercostals	Sensory level, Supf abdominal reflex, Beevors' sign
T9-10	Upper abdominals	
T11-12	Lower abdominals	
L1-2	Cremaster m	Cremasteric reflex
S3-5	Anal sphincter	Anal reflex
Beevors' sign: Lift head off the bed by flexing neck ➔ lower abdomen m (Below T9), umblicus moves cephaud		

Neck flexor extensor

Upper-limb Strength

Root	Movement	Muscle	Nerve	Root
Shoulder	abductor	Deltoid	axillary	C5-6
	adductor	Latissimus dorsi Pectoralis major	thoracodorsal nerve lateral and medial pectoral nerves	C6-8 C5-T1
	flexor	Deltoid Biceps	Axillary musculocutaneous	C5-6 C5-6
Elbow	flexor	Biceps Brachioradialis	musculocutaneous radial	C5-6 C5-6
	extensor	Triceps	radial	C7-8
	pronation	Pronator teres Pronator quadrantus	median median (anterior interosseous)	C6-7 C8-T1
	supination	Supinator	radial (deep branch)	C7
Wrist	extensor	Wrist	radial	C6-7
	flexors	Wrist flexors	median and ulnar	C6,7,8
Fingers	flexors	Finger flexors	median and ulnar	C7,8,T1
	spreader	Intrinsic fingers	ulnar	C8
	opposition	Finger opposition	median	C8

Lower-limb Strength

Joint	Movement	Muscle	Nerve	Root
Hip	Flexion	Iliopsoas	femoral	L2,3,4
	Extension	G. max	gleteal	S1
	Adduction	Adductors		L2,3,4
	Abduction	G. Max G. med/min/TFL	Inf. gluteal Sup. gluteal	L4,5,S1
Knee	Extension	Quadriceps	Femoral	L2,3,4
	Flexion	Hamstrings Biceps femoris, Semimem, semiten	Sciatic	L5,S1,2
Ankle	Dorsiflexors	Tibialis anterior	Peroneal	L4-5
	Plantar flexors	Gastrocnemius Soleus	Tibial Tibial	S1-2 S1-2
	Inversion	Tibialis posterior	Tibilais	L4,L5,S1
	Eversion	Peroneus longus	Superficial peroneal n	L5,S1
Toe	Flexion	FHL / FDL	Tibial	L5,S1,S2
	Extension	EHL / EDL	Deep peroneal	L4,5,S1 L5,S1

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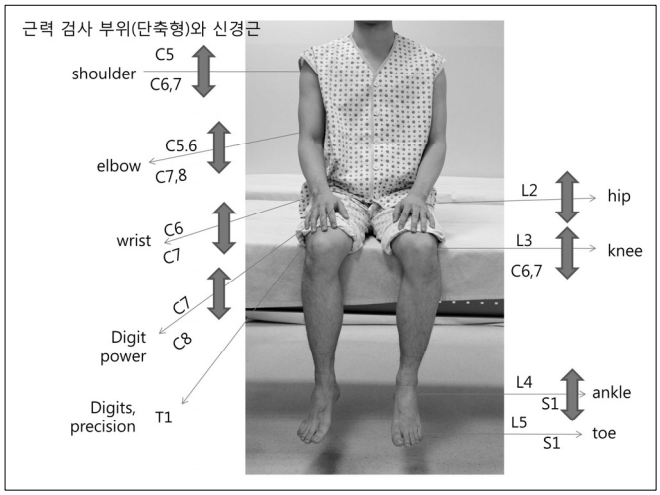

Other Tests

- Tone
  - Arm dropping test
  - Knee dropping test
- Power
  - Arm drift test
  - Leg elevation test

Rebound phenomenon
Gegenhalten

Coordination Exam

- **Rapid alternating movements (RAM):** rapidly pronate and supinate hands. Dysdiadochokinesia
- **Finger to nose (FTN):** touches nose, then examiner's finger, then goes back& forth rapidly. Dysmetria
- **Heel to shin (HTS):** moves one heel down the other shin. Dysmetria

cf) Fine motor: rapidly touches thumb to each finger of same hand. Cortical lesions (tumor or stroke). Clumsiness

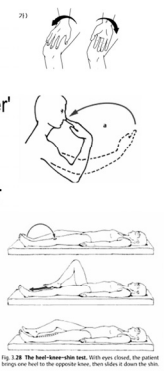

fig. 3.28 **The heel-knee-shin test.** With eyes closed, the patient brings one heel to the opposite knee, then slides it down the shin.

Fundamentals of neurology: an illustrated guide

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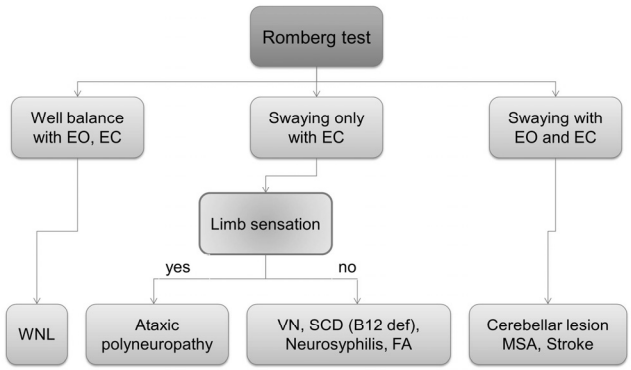
Station and Gait

- **Station:** can stand still with her feet less then shoulder width apart.
  Romberg's sign: stands with feet together and closes eyes.
  posterior column disease vs. cerebellar disease

- **Natural gait**: can walk with a smooth, coordinated gait.
  normal associated movement of the upper extremities
  Heel and toe walking: test balance and distal leg power.
  Tandem gait: walk heel-to-toe. test balance wo falling or side stepping

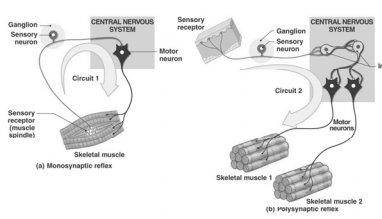
cf) Seven pathological gaits:
Hemiplegic, Spastic diplegic, Neuropathic, Myopathic, Parkinsonian, Chorea, Ataxic

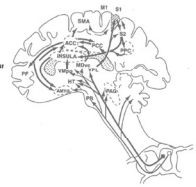
Disequilibrium Causes



Reflex System Circuit

- Deep tendon reflex
  one sensory neuron → one interneuron → one motor neuron
- Superficial reflex (scratch reflex)
  one sensory neuron → multiple interneurons → multiple motor neurons





Nociceptive Reflexive Movements

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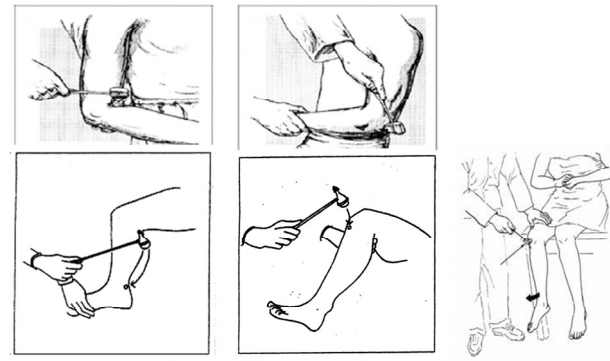
2. Reflexes

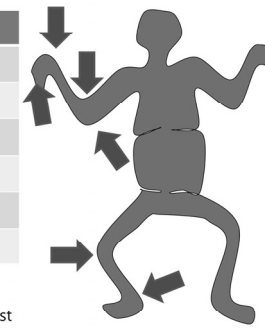
Types	Areas
Deep tendon reflexes	biceps (B/J), brachioradialis (BR/J) triceps (T/J) quadriceps (K/J), gastrocnemius (A/J)
Superficial reflexes	corneal reflex superficial abdominal reflex cremasteric reflex, anal reflex
Pathologic reflexes	finger sign (Tromner, Hoffman) toe sign (Babinski, Chaddock)

Deep Tendon Reflexes (DTR)



DTR Levels

DTR	Level	Nerve
Biceps	C5-6	MC
Brachioradialis	C5-6	Radial
Triceps	C7>C8	Radial
Finger flexors	C8	Median
Patellar	L3-4	Femoral
Ankle	L5<S1	Femoral



Facilitation maneuver
- Active strong raising of head of the headrest
- Jendrassik hand grip (maneuver)
- Active plantar flexion of the foot

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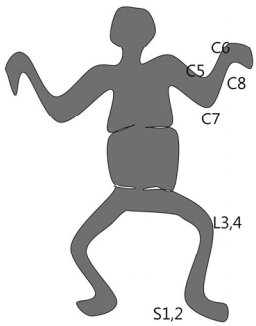
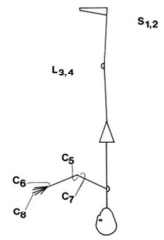
Reflex Man





DTR Grading

NINDS Myotatic Reflex Scale (Hallett, Neurology 1993;43:2723)

Grade	Explanation	Reflexes
0	Reflex not elicited	Absent
1+	Reflex small, less than normal; includes trace responses or responses brought out only with reinforcement	Hypoactive
2+	Reflex in lower half of normal range	Normal
3+	Reflex in upper half of normal range	Brisk and excessive
4+	Reflex enhanced, more than normal; includes clonus, if present, which optionally can be noted in added verbal description of reflex	Hyperactive with clonus

Superficial Reflexes

Superficial reflexes	Level	Test	Muscle
Abdominal	T8-T9 T11-12	Stroke each quadrant	Abdominalis
Cremasteric	L1-2	Stroke the inner thigh (sensory and motor fibers of the genitofemoral nerve)	Cremaster
Bulbo-cavernous	S3-4	Squeeze the head of the penis (S2-S3)	Anal sphincter
Anal	S3-5	Stroke the perianal skin (S3-S4)	

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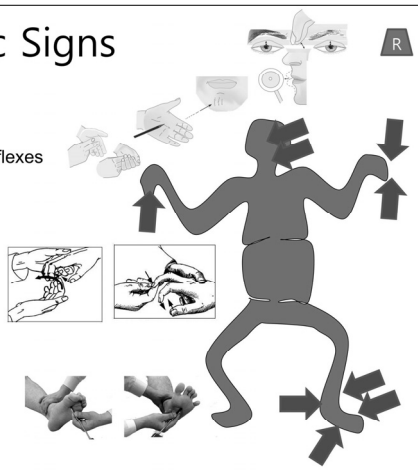
Pathologic Signs

Frontal release signs
- Glabellar reflex
- Snout, suck, root reflexes
- Palmomental reflex
- Grasp reflex

Finger signs
- Tromner sign
- Hoffmann

Toe signs
- Babinski's sign
- Chaddock's sign
- Oppenheim's sign
- Gordon's sign



Joseph Jules François Félix Babinski

Dorsiflexion of the great toe with extension and fanning of the ot her toes

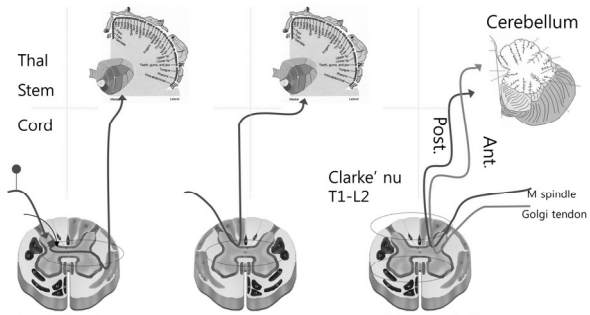
바빈스키

normal plantar reflex

Babinski's sign

3. Sensory System

Sensory Pathways

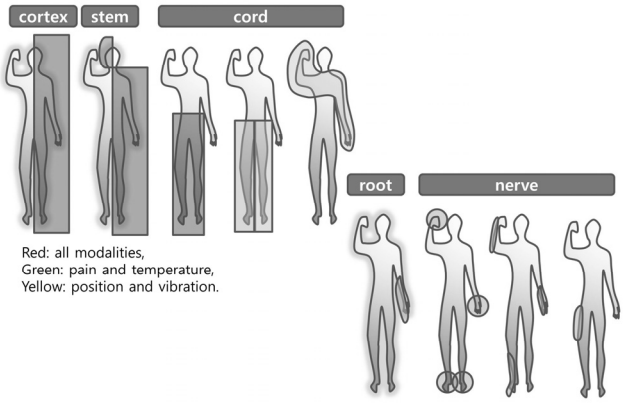


Spinothalamic
pain, temperature
touch

Dorsal columnar
medial lemniscal
position, vibration
touch

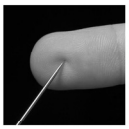
Spinocerebellar
unconsc. propriocep.

Common Patterns of Sensory Loss



Red: all modalities,
Green: pain and temperature,
Yellow: position and vibration.

Sensory Examination



Spontaneous sensory complaint
paresthesia, dysethesia, allodynia
Primary sensory
superficial pain/temperature, touch
deep position/vibration
Sensory dissociation
Sensory level
Cortical sensory
two-point discrimination
graphesthesia, topesthesia, stereognosis
double simultaneous stimulation

Problem-oriented Approach in Sensory Examination

Left , Right, Bilateral
Distal, proximal
Radicular, dermatomal
Nerve distribution
Spinal sensory level

Scoring
Ascending/descending

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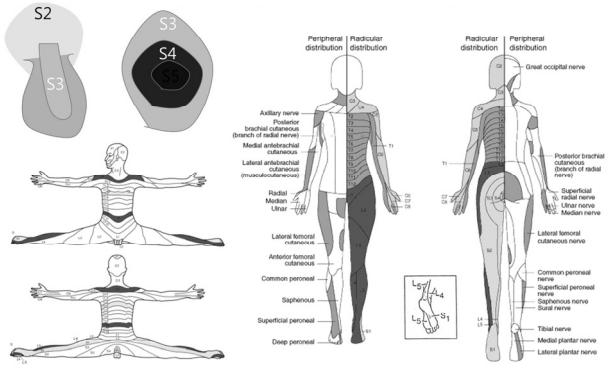
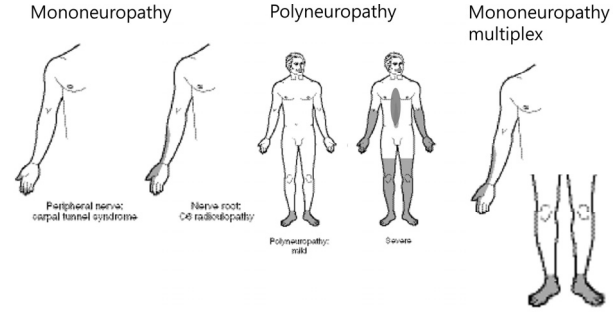
Dermatome; Radicular vs. Peripheral distribution

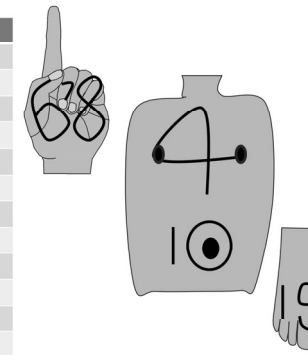


Location

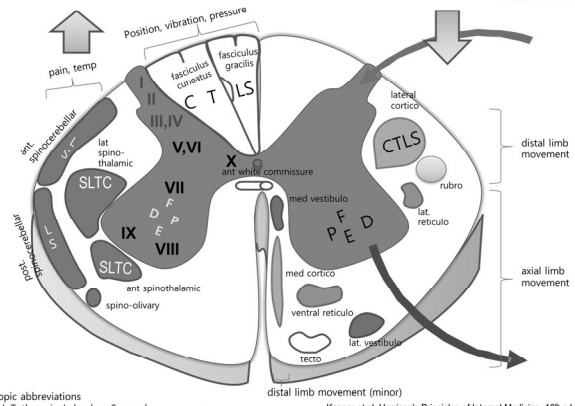


Key Sensory Landmarks

Level	Dermatomes
C5	Shoulder
C6	Thumb
C7	Middle finger
C8	Little finger
T4	Nipple
T6	Xyphoid
T10	Umbilicus
L3	Just above patella
L4	Medial malleolus
L5	Big toe
S1	Lateral malleolus
S3-5	Perianal



Somatotopic Organization



Somatotopic abbreviations
C: cervical, T: thoracic, L: lumbar, S: sacral

Kasper et al. Harrison's Principles of Internal Medicine, 16th ed

Spinal Cord Syndromes

Involvement	Sensory	Motor	Sphincter
Posterior cord syndrome	Both position vibration loss	No weakness ataxia	No
Central cord	Variable	U/E weakness distal > proximal	Variable
Brown-Séquard syndrome	Ipsilateral position and vibration loss Contralateral pain and temperature loss	Motor loss ipsilateral to lesion	Variable
Anterior cord syndrome	Loss of pin/touch vib/position preserved	Motor loss or weakn below level	Variable
Transverse cord syndrome	Complete loss of sen below level of cord injury	Loss of vol motor fn below cord level	Sphx control lost

4. Autonomic

- Anatomy
  - Longitudinal
  - Axial
- Evaluation
  - Sweating
  - Limb temperature
  - Hair and nail growth
  - Skin color changes

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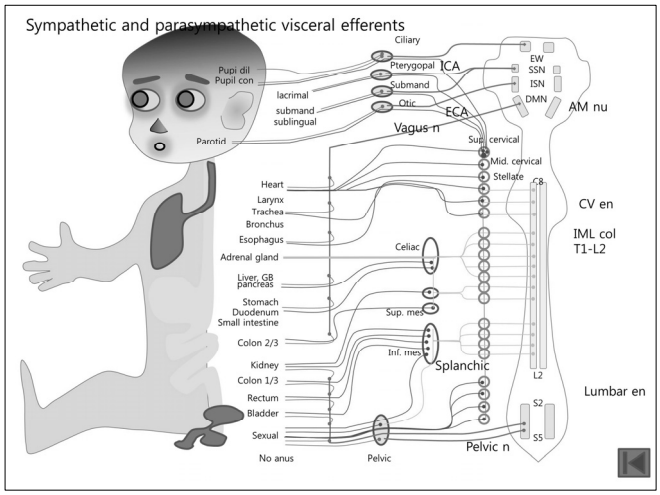
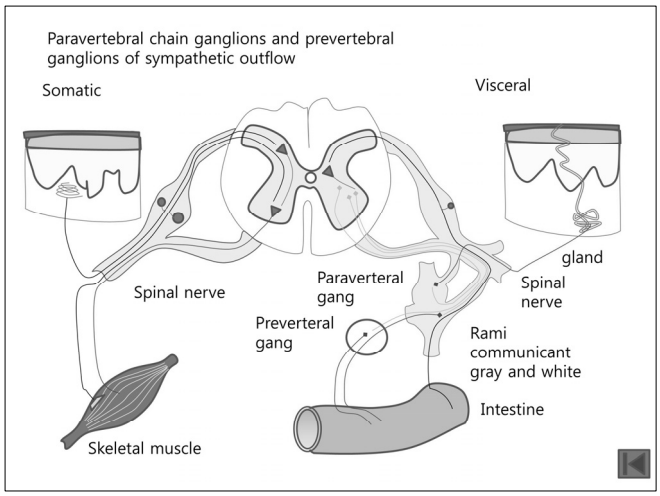




Descriptions (Normal Examination)

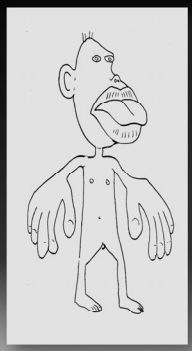
- Patient fully conscious, oriented in time and place
- Pupils equal, reactive to light and accomodation, fundus (VA, VF) intact
- Extraocular movements full without nystagmus
- Facial sensations normal
- Facial expression symmetrical
- Hearing normal
- Palate rises symmetrically, Gag preserved bilaterally, Tongue central
- No meningeal irritation signs
- No atrophy/fasciculations, Tone preserved, Power 5/5 in all 4 limbs
- No cerebellar signs, Romberg negative, Gait normal
- Reflexes symmetrical, no pathologic reflexes
- Sensation preserved
- No dysautonomia

Neurological Examination

- Critical way station in clinical decision-making
- Variable personal style, emphasis, test order
- Titrated function from easy to difficult
- Parts of N/E in greater or less detail
- Follow-up examinations

- Understanding how to best tailor the exam to the clinical situation comes with experience and practice.

신경학적 진찰



747전법

감정동반자얼수

상하코너

ABCD

747 practice, practice

감사합니다.

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MEMO