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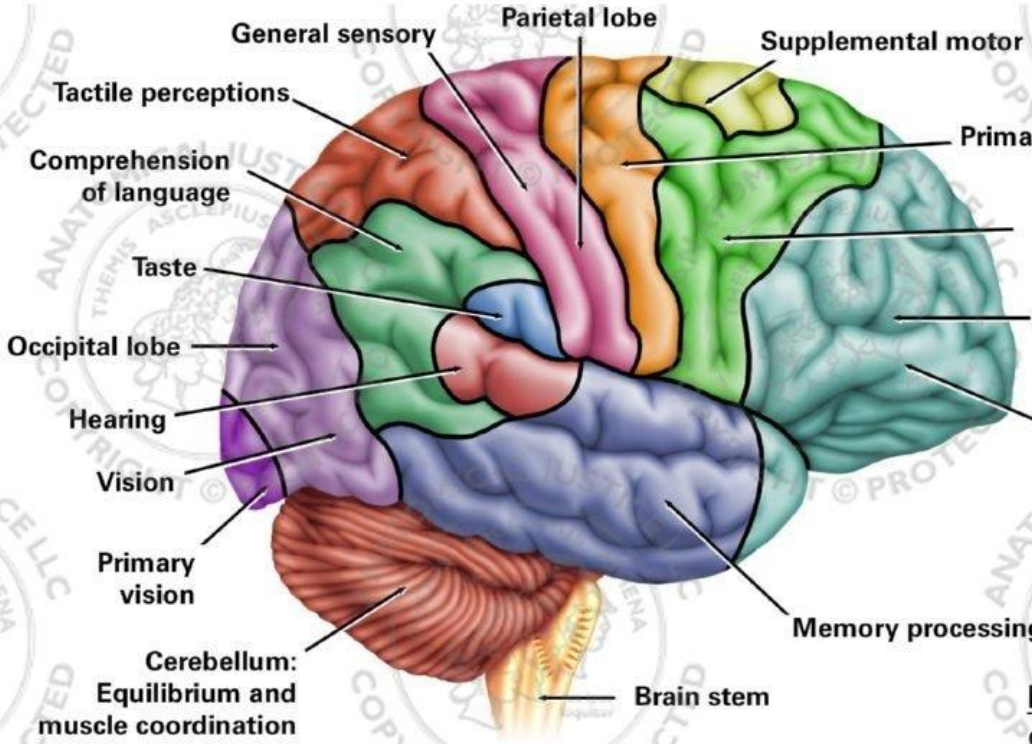
Neurological Charts

v. 6/25/2022

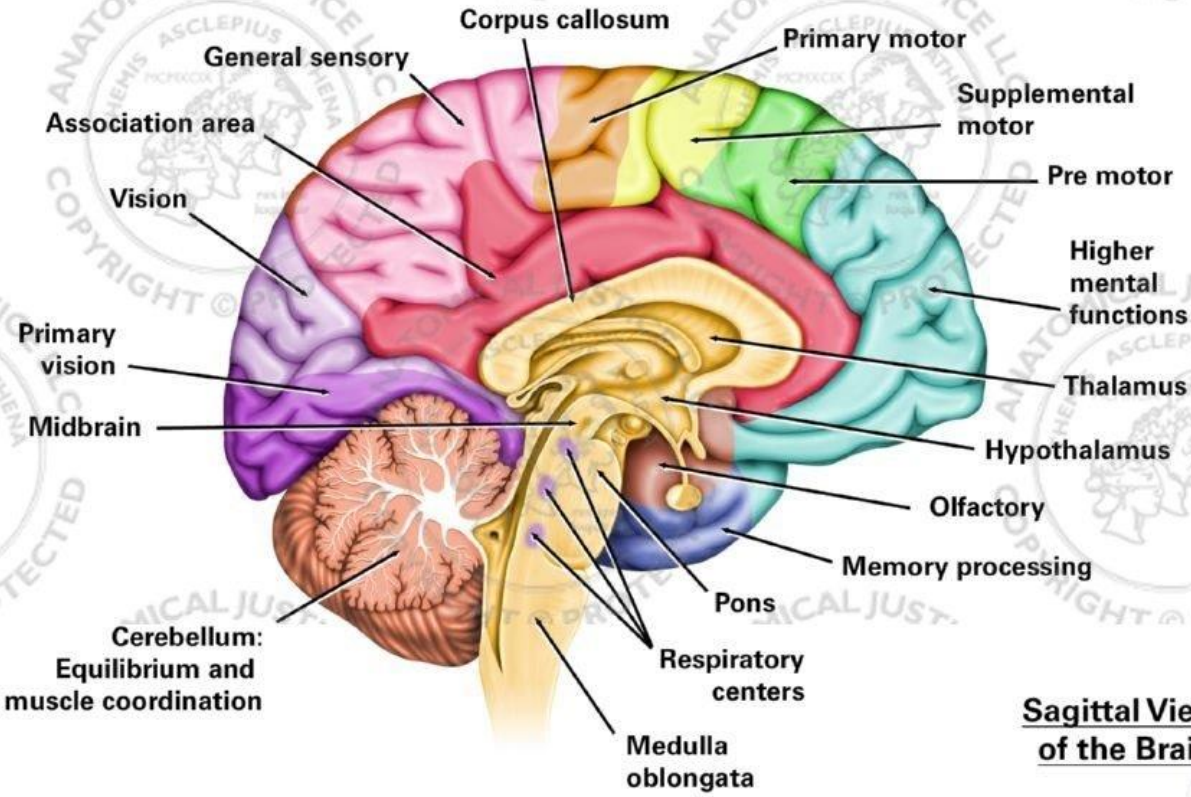
1. Brain (Right vs. Left)
2. Motor & Sensory Cortex
3. Cranial Nerves (2)
4. Trigeminus
5. Dermatomes (4)
6. Myotomes (2)
7. Spinal Cord Injury Classification
8. Brachial Plexus
9. Peripheral Nerves, Arm (2)
10. Elbow Nerves
11. Elbow & Forearm
12. Motor Nerves, Arm
13. Lumbar Plexus
14. Sensory Nerves, Groin
15. Saphenous Nerve
16. Peroneal Nerve
17. Peripheral Nerves, Leg
18. Motor Nerves, Leg
19. Sclerotomes, Neck by Facets Sclerotomes, Body

attachments

Anatomy and Functions of the Right Brain

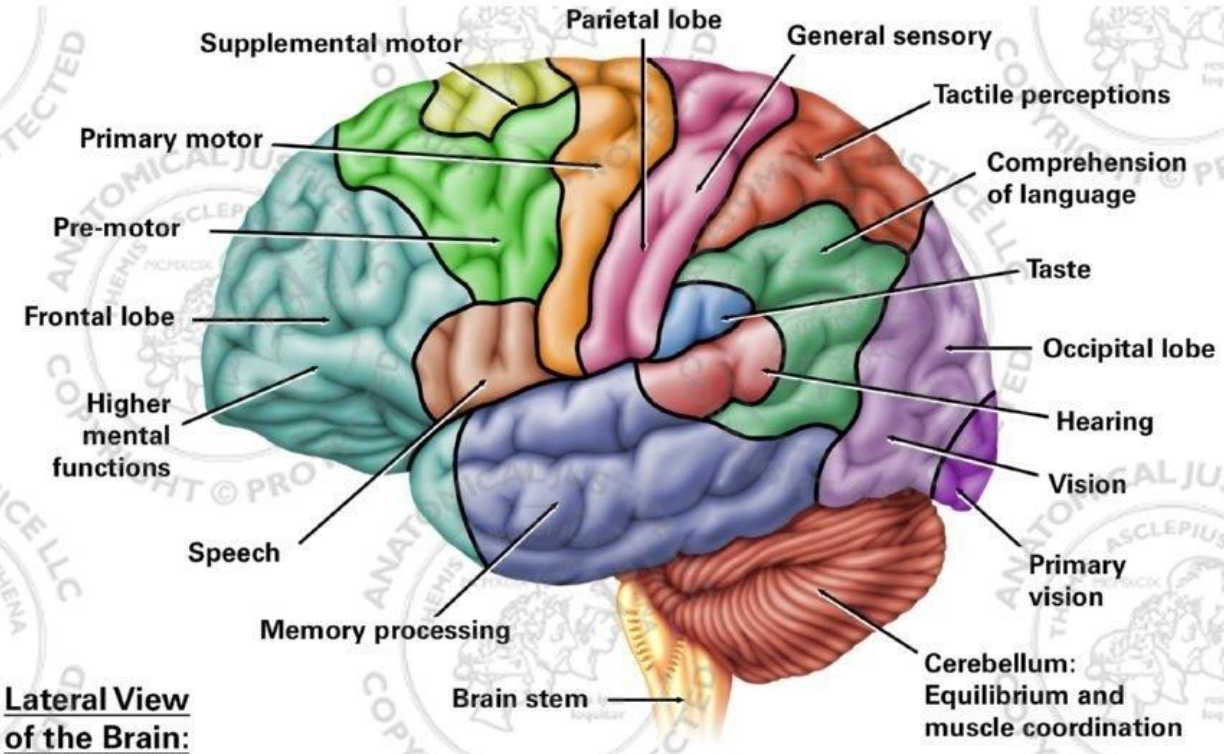


Lateral View of the Brain:

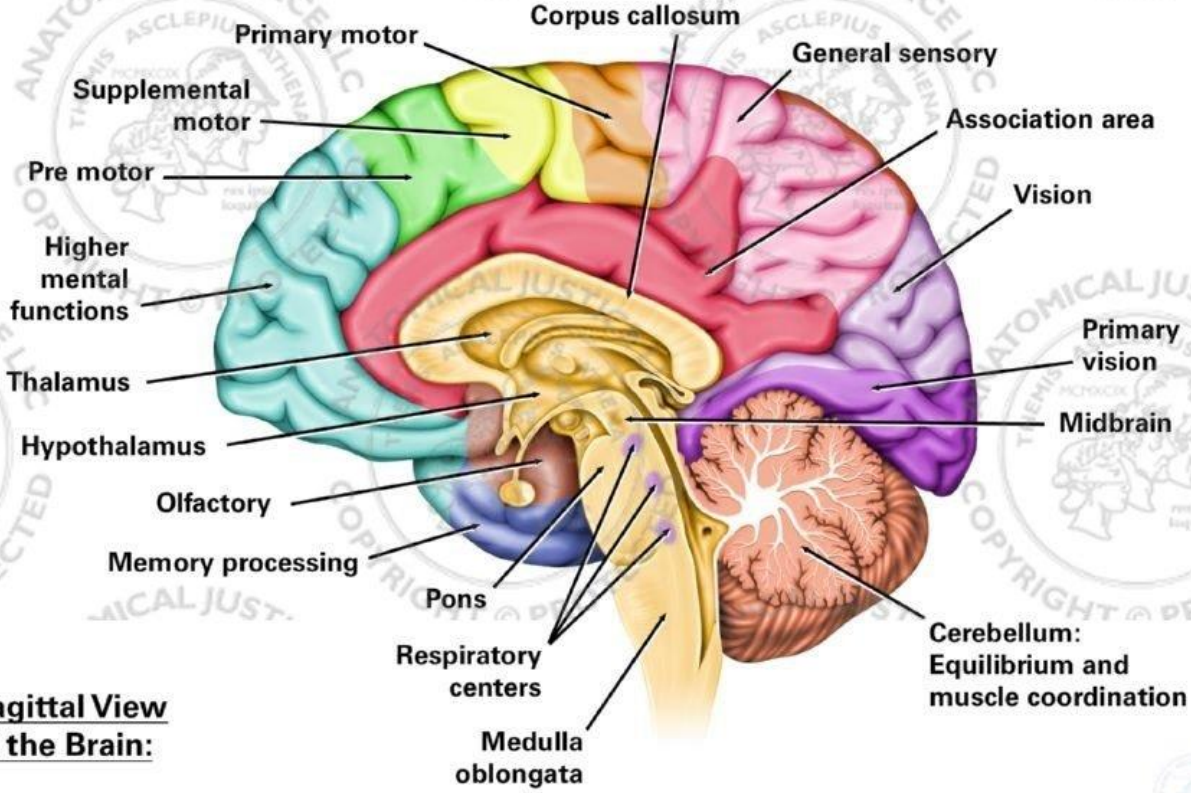


Sagittal View of the Brain:

Anatomy and Functions of the Left Brain

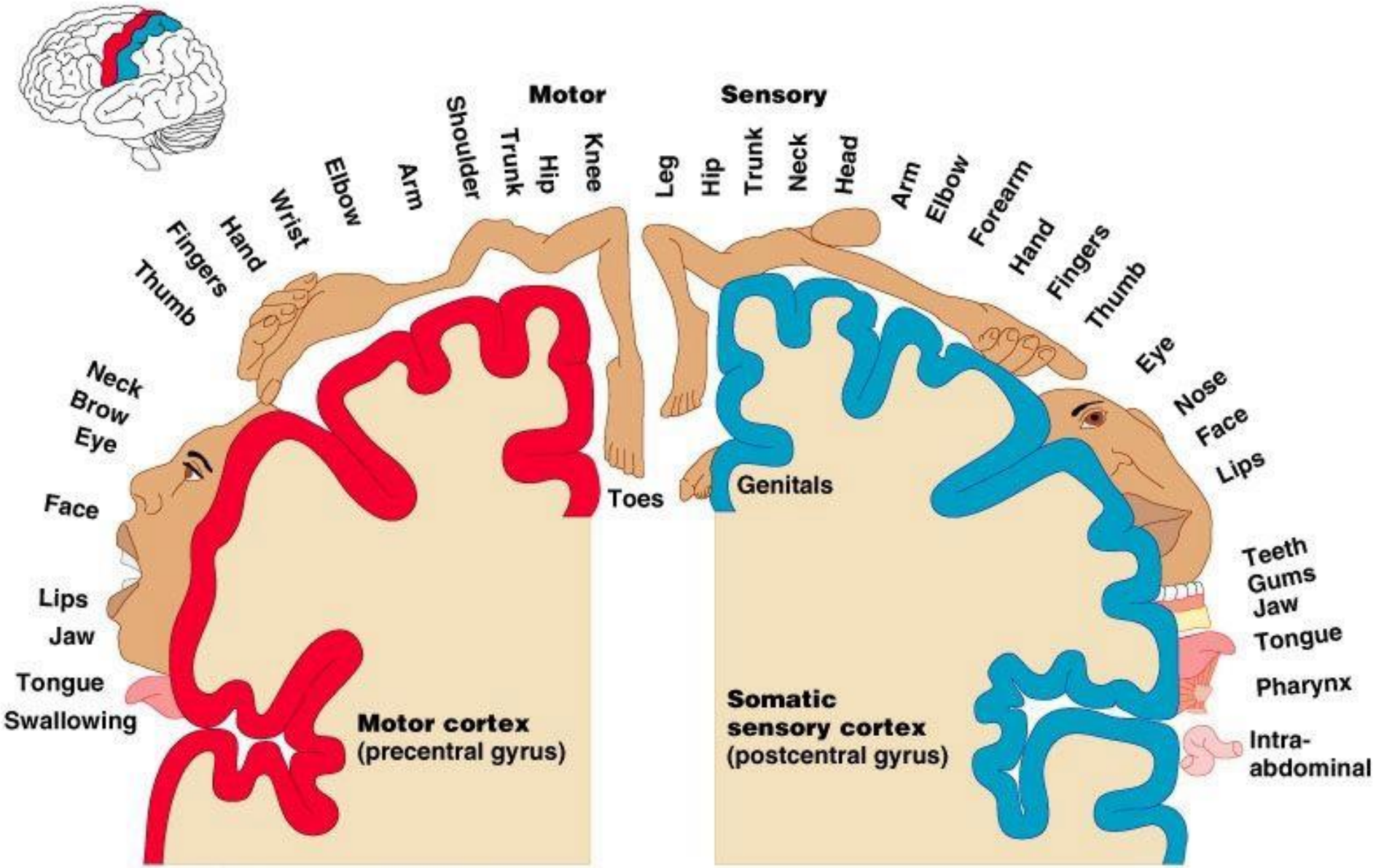


Lateral View of the Brain:

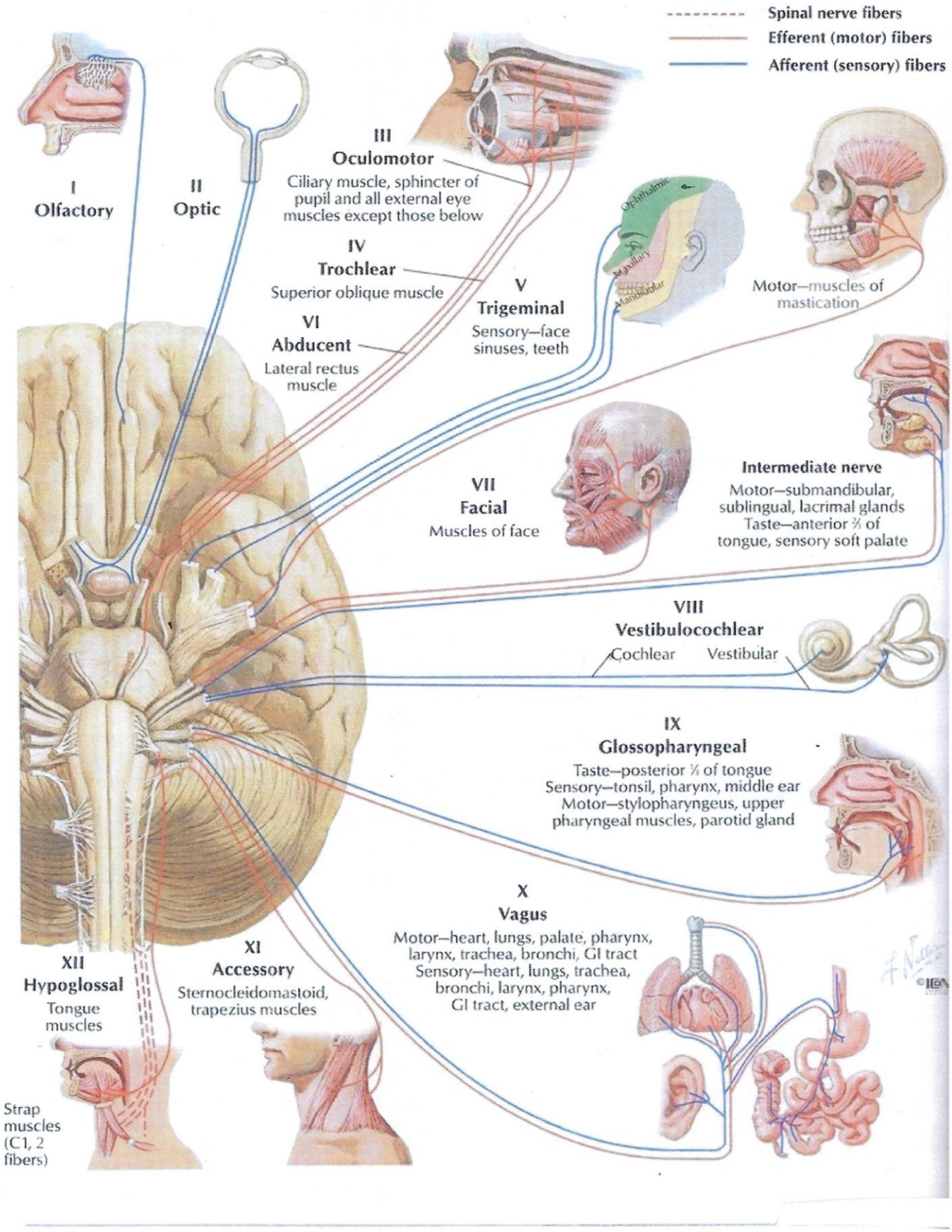


Sagittal View of the Brain:

Motor and Sensory Cortex



Cranial Nerves

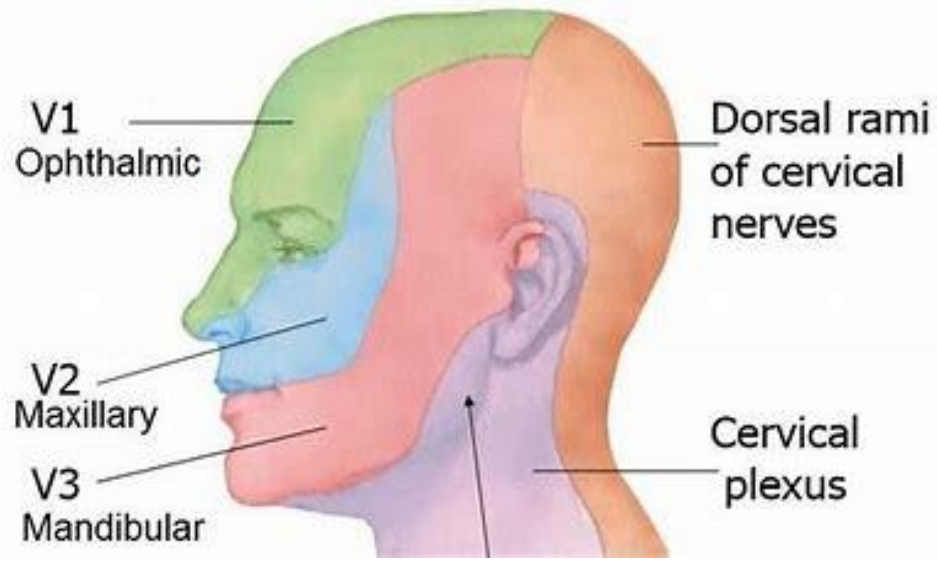


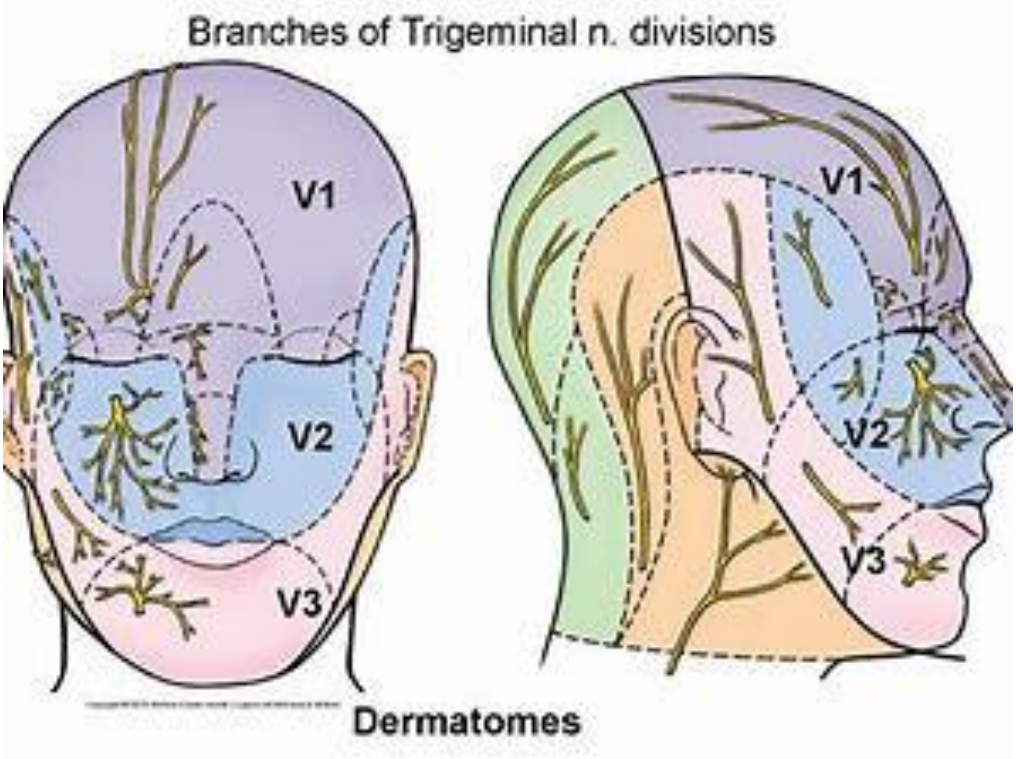
Cranial Nerves

CRANIAL NERVES: SUMMARY TABLE.

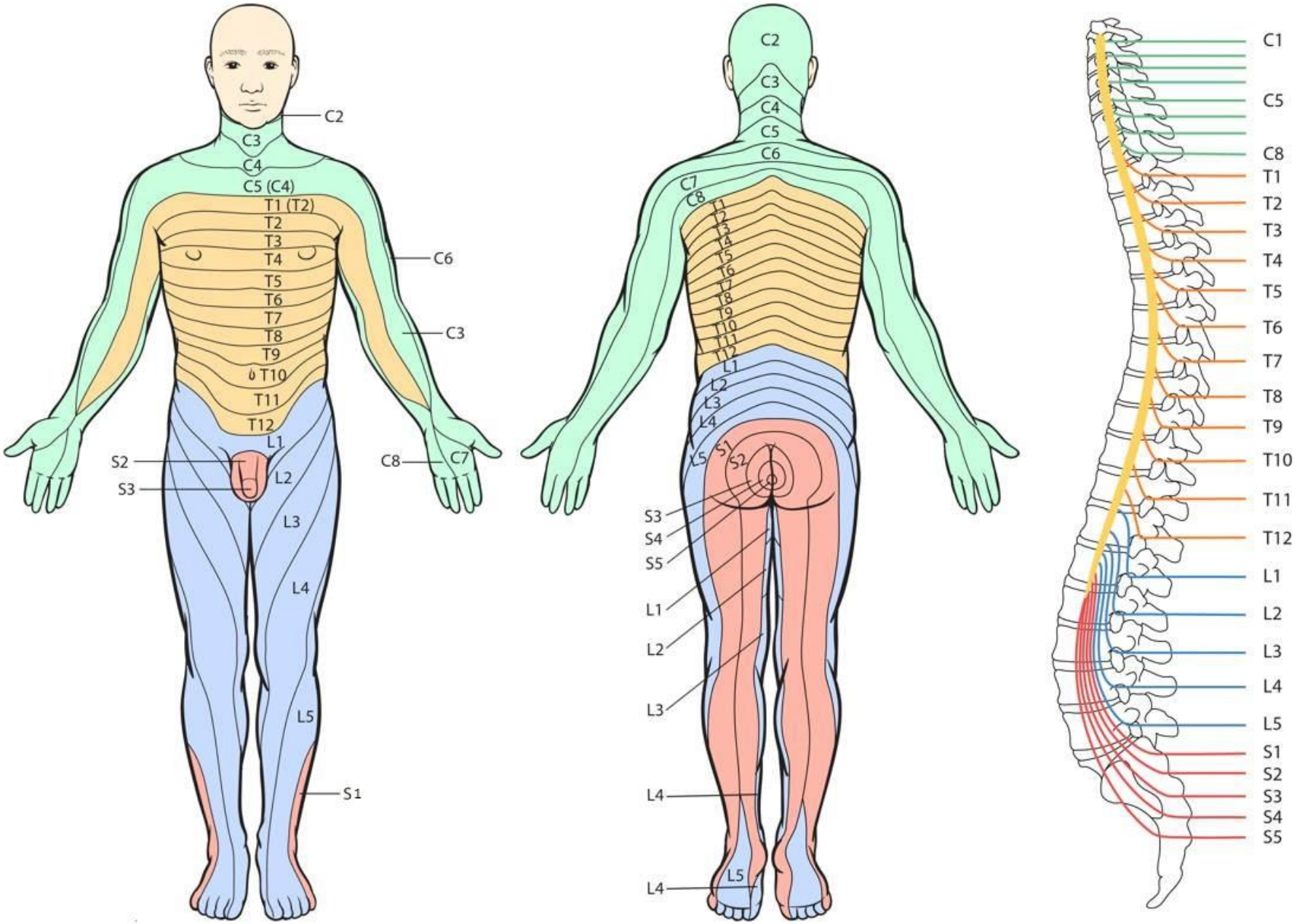
Cranial nerve	Nucleus name	Nucleus location	Function	Symptom/sign of damage
Olfactory (CNI)	Anterior olfactory	Olfactory tract	Smell	Anosmia
Optic (CNII)	Lateral geniculate nucleus	Thalamus	Vision	Blindness
Oculomotor (CNIII)	Oculomotor	Midbrain	Eye movement	Eye deviates down & out
	Edinger Westphal	Midbrain	(elevation, adduction)	Loss of pupillary/accommodation reflexes
Trochlear (CNIV)	Trochlear	Midbrain	Eye movement (depression of adducted eye)	Diplopia, lateral deviation of eye
Trigeminal (CNV)	Principal	Pons	Facial sensation	Facial aneasthesia
	Spinal	Medulla	Mastication	Loss of pain sensation
	Mesencephalic	Pons/midbrain		Insignificant
	Motor	Pons		Weakness/loss of mastication
Abducent (CNVI)	Abducent	Pons	Eye movement (Abduction)	Medial eye deviation
Facial (CNVII)	Motor	Pons	Facial expresssion	Paralysis of facial nerve muscles (+ hyperacuisis)
	Solitary	Pons	Taste	Loss of taste (anterior 2/3rds of tongue)
	Superior salivatory	Pons	Salivation, lacrimation	Dry mouth, loss of lacrimation
Vestibulocochlear (CN VIII)	Vestibular	Medulla	Balance	Vertigo, dysequilibrium, nystagmus
	Cochlear	Medulla	Hearing	Hearing
Glossopharyngeal (CN IX)	Nucleus ambiguus	Medulla	Taste	Loss of taste (posterior 1/3rd of tongue)
	Inferior salivatory	Medulla	Salivation	Insignificant
	Solitary	Medulla	Innervation of pharynx	Loss of gag reflex
Vagus (X)	Nucleus ambiguus	Medulla	Swallowing & talking	Dysphagia & hoarseness of voice
	Dorsal motor vagal	Medulla	Cardiac, GI tract, respiration	Insignificant
	Solitary	Medulla	Taste	Loss of cough reflex (larynx/pharynx), loss of taste (hard palate)
Cranial Accessory (XI)	Nucleus ambiguus	Medulla	Pharynx/larynx muscles	Insignificant
Spinal accessory	Spinal accessory	Cervical cord	Neck & shoulder movement	Head turning/shoulder shrugging weakness
Hypoglossal (XII)	Hypoglossal	Medulla	Tongue movement	Atrophy of tongue muscles, deviation on protrusion, fasciculaations

Trigeminal Nerve





Dermatomes


C2
C3
C4
C5 (C4)
T1 (T2)
T2
T3
T4
T5
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T11
T12
L1
L2
L3
L4
L5
S1
S2
S3
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C8
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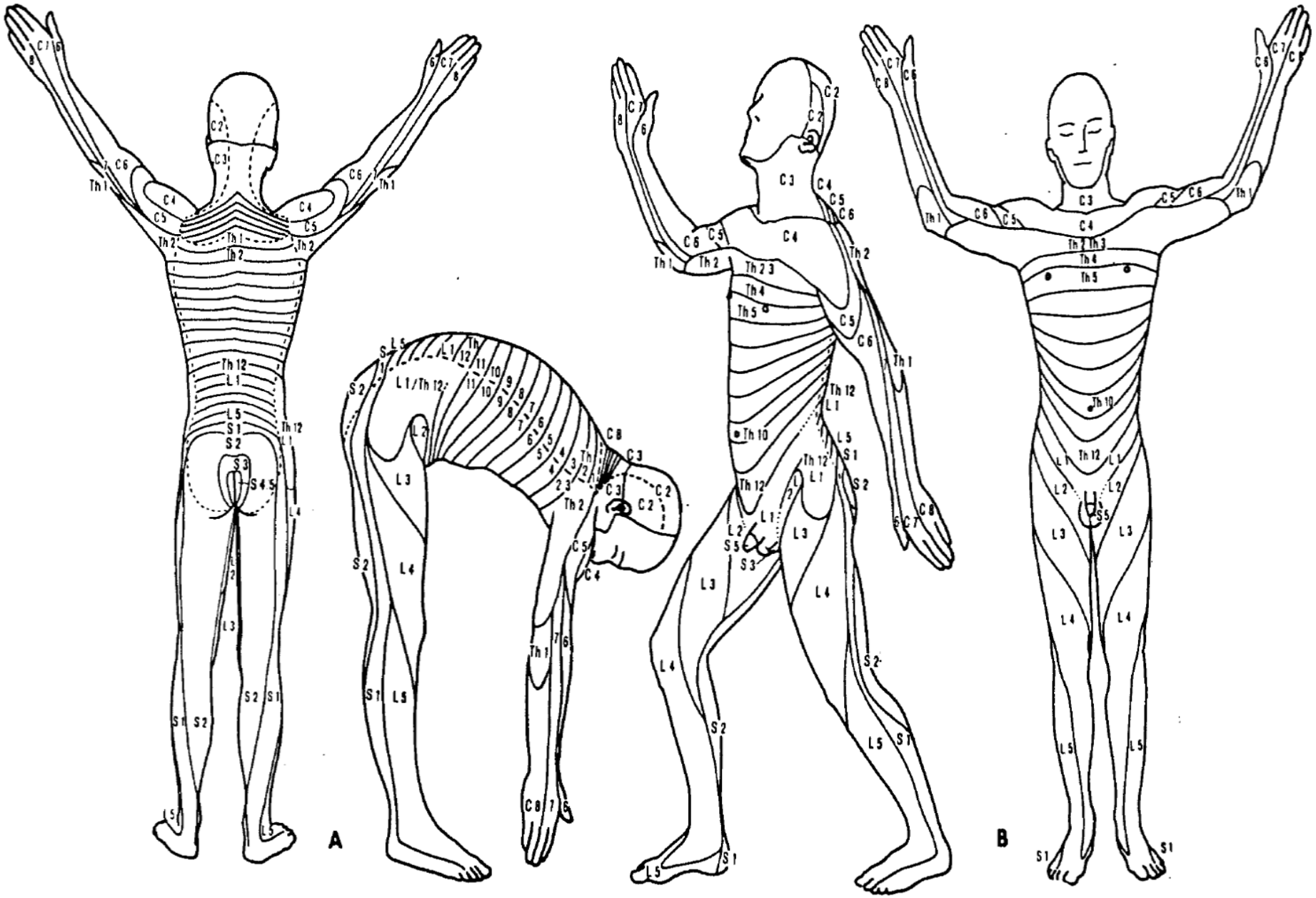
S3
S4
S5



Dermatomes. *A*, Back and side. *B*, Side and front.

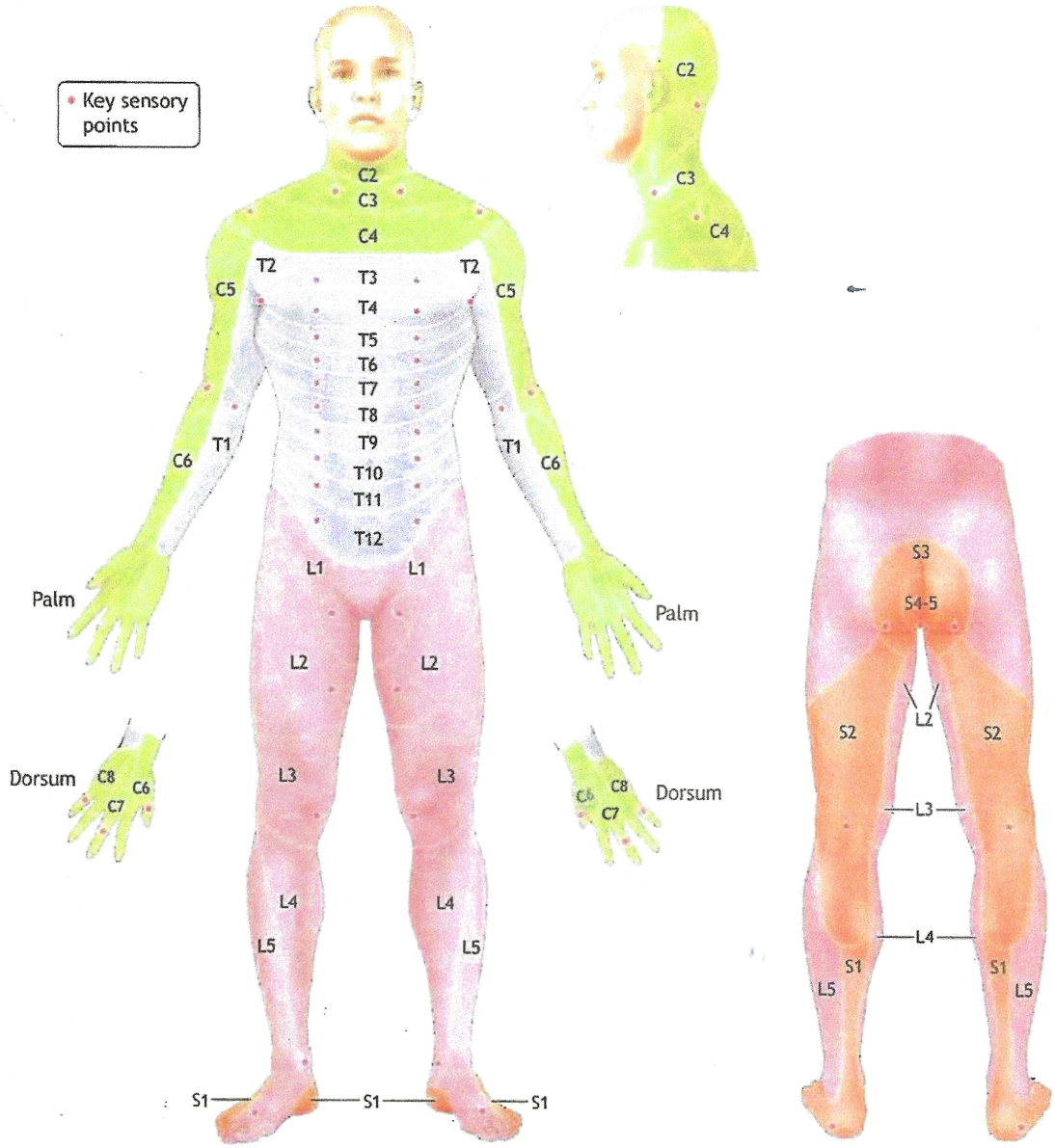
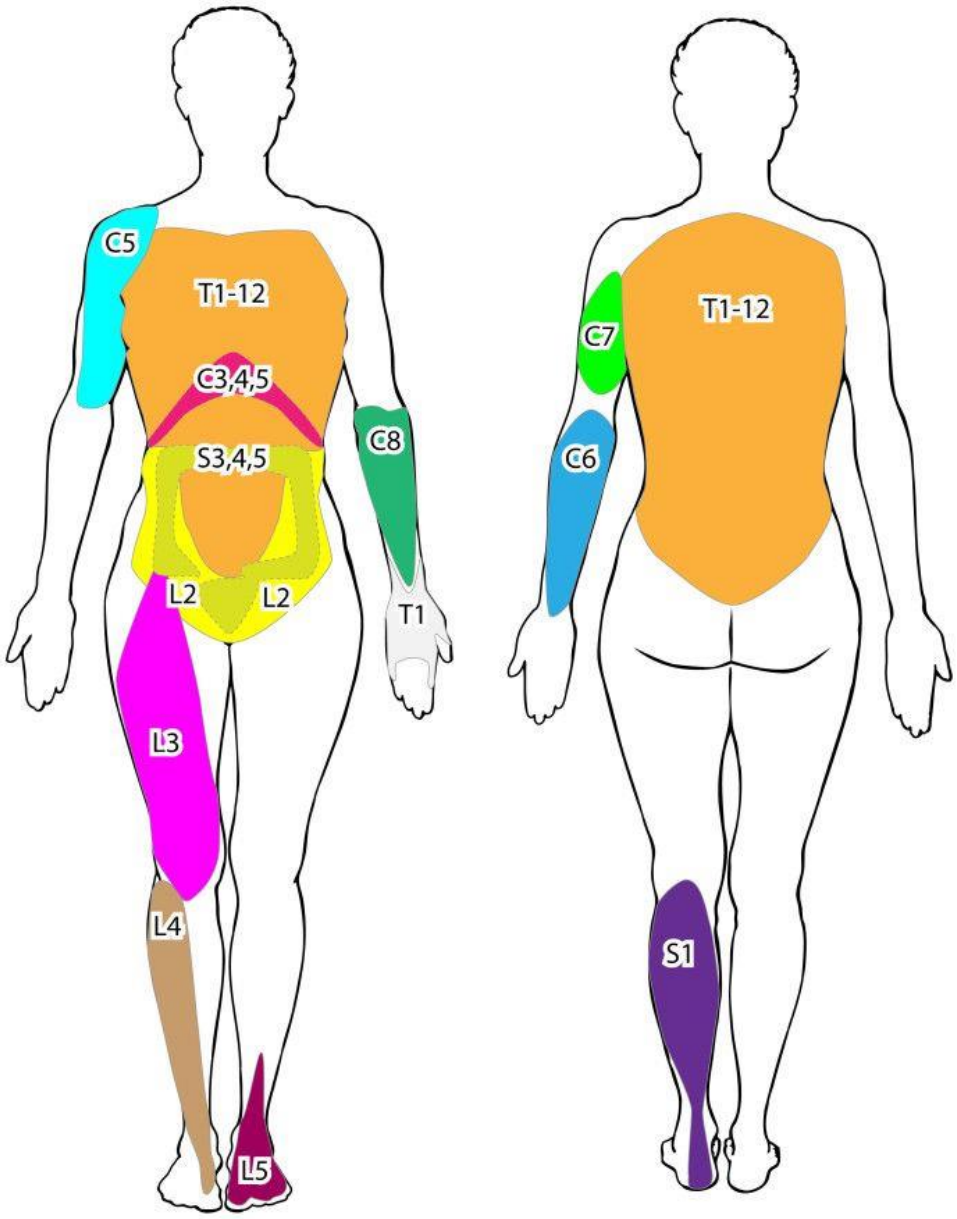


Figure 7-3 Key Sensory Points by Spinal Dermatomes. (Adapted from American Spinal Injury Association: International *Standards for Neurological Classification of Spinal Cord Injury*, revised 2002. Chicago, IL: American Spinal Injury Association; 2002.

- T12—Symphysis pubis
- L4—Medial aspect of the calf
- L5—Web space between the first and second toes
- S1—Lateral border of the foot
- S3—Ischial tuberosity area
- S4 and S5—Perianal region

- C5—Deltoid
- C6—Wrist extensors (biceps, extensor carpi radialis longus and brevis)
- C7—Elbow extensors (triceps)
- C8—Finger flexors to the middle finger (flexor digitorum profundus)
- T1—Small finger abductors (abductor digiti minimi)
- L2—Hip flexors (iliopsoas)
- L3, L4—Knee extensors (quadriceps, patellar reflexes)
- L4, L5 to S1—Knee flexion (hamstrings)
- L5—Ankle and big toe dorsiflexors (tibialis anterior and extensor hallucis longus)
- S1—Ankle plantar flexors (gastrocnemius, soleus)

MYOTOMES



Upper Limb Myotomes

Shoulder abduction	C5
Elbow Flexion	C5,6
Elbow Extension	C7
Wrist Extension	C7
Wrist Flexion	C8
Finger Extension	C7
Finger Flexion	C8
Finger Abduction	T1

Lower Limb Myotomes

Hip Flexion	L1,2
Hip Extension	L5, S1
Knee Flexion	L5, S1
Knee Extension	L3,4
Ankle Dorsiflexion	L4
Ankle Plantarflexion	S1,2
1st Metatarsal Extension	L5

Reflexes

Ankle	S1,2
Knee	L3,4
Biceps	C5,6
Triceps	C7,8

Patient Name _____

Examiner Name _____ Date/Time of Exam_____

ASIA
American Spinal Injury Association

STANDARD NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY

ISCOS

MOTOR

KEY MUSCLES
(scoring on reverse side)

	R	L	
C5	☐	☐	Elbow flexors
C6	☐	☐	Wrist extensors
C7	☐	☐	Elbow extensors
C8	☐	☐	Finger flexors (distal phalanx of middle finger)
T1	☐	☐	Finger abductors (little finger)

UPPER LIMB TOTAL (MAXIMUM) ☐ + ☐ = ☐ (25) (25) (50)

Comments:

	R	L	
L2	☐	☐	Hip flexors
L3	☐	☐	Knee extensors
L4	☐	☐	Ankle dorsiflexors
L5	☐	☐	Long toe extensors
S1	☐	☐	Ankle plantar flexors

Voluntary anal contraction (Yes/No) ☐

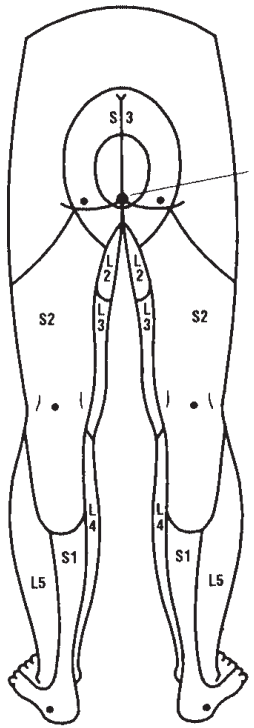
LOWER LIMB TOTAL (MAXIMUM) ☐ + ☐ = ☐ (25) (25) (50)

SENSORY

KEY SENSORY POINTS

	LIGHT TOUCH R	LIGHT TOUCH L	PIN PRICK R	PIN PRICK L
C2				
C3				
C4				
C5				
C6				
C7				
C8				
T1				
T2				
T3				
T4				
T5				
T6				
T7				
T8				
T9				
T10				
T11				
T12				
L1				
L2				
L3				
L4				
L5				
S1				
S2				
S3				
S4-5				

0 = absent
1 = impaired
2 = normal
NT = not testable

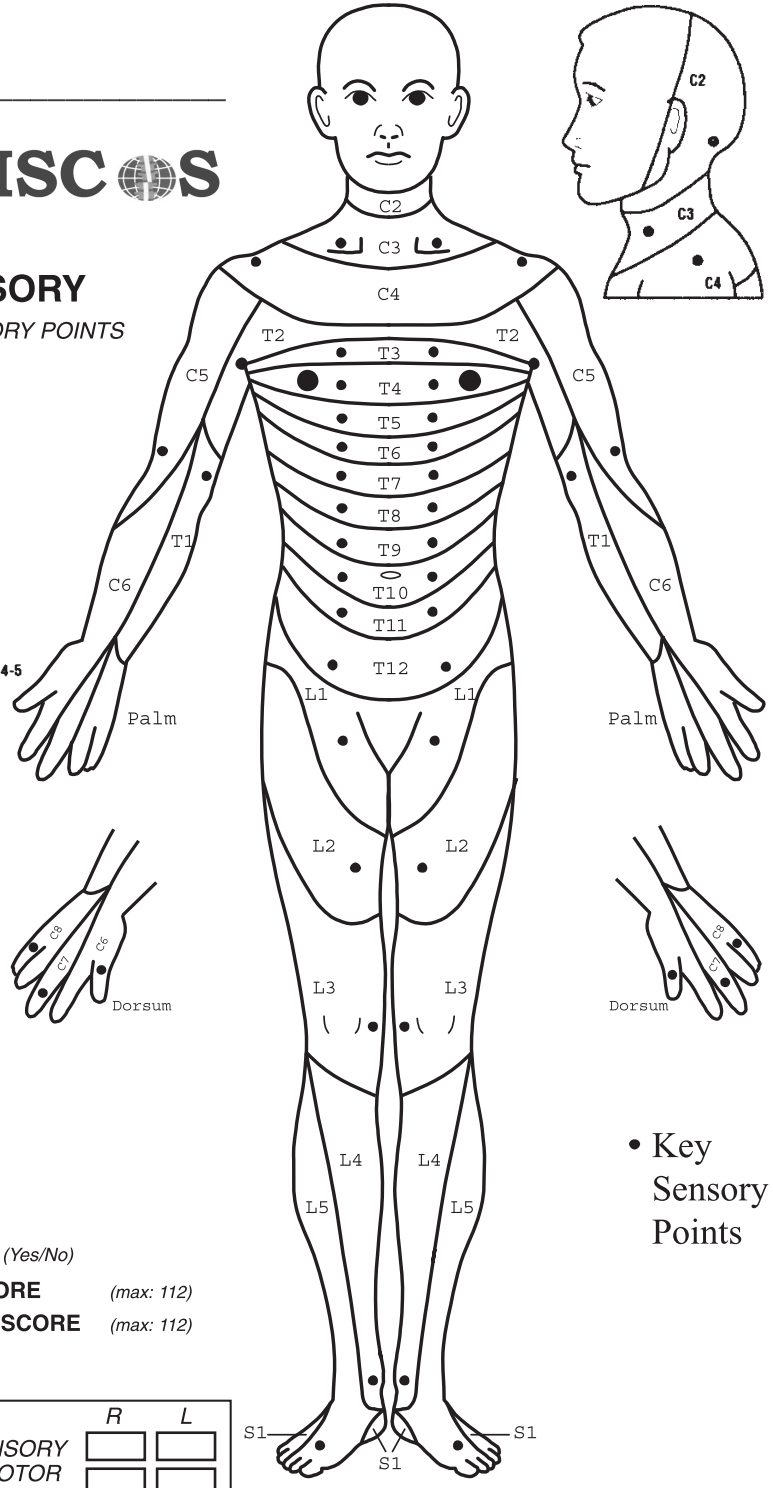


☐ Any anal sensation (Yes/No)

TOTALS (MAXIMUM) ☐ + ☐ = (56) (56) (56) (56)

☐ PIN PRICK SCORE (max: 112)

☐ LIGHT TOUCH SCORE (max: 112)



• Key Sensory Points

NEUROLOGICAL LEVEL	SENSORY R	SENSORY L	COMPLETE OR INCOMPLETE?	ZONE OF PARTIAL PRESERVATION	SENSORY R	SENSORY L
The most caudal segment with normal function			*Incomplete = Any sensory or motor function in S4-S5* ☐	*Caudal extent of partially innervated segments*		
	MOTOR		ASIA IMPAIRMENT SCALE ☐		MOTOR	

REV 03/06

MUSCLE GRADING

0 total paralysis

1 palpable or visible contraction

2 active movement, full range of motion, gravity eliminated

3 active movement, full range of motion, against gravity

4 active movement, full range of motion, against gravity and provides some resistance

5 active movement, full range of motion, against gravity and provides normal resistance

5* muscle able to exert, in examiner's judgement, sufficient resistance to be considered normal if identifiable inhibiting factors were not present

NT not testable. Patient unable to reliably exert effort or muscle unavailable for testing due to factors such as immobilization, pain on effort or contracture.

ASIA IMPAIRMENT SCALE

☐ **A = Complete**: No motor or sensory function is preserved in the sacral segments S4-S5.

☐ **B = Incomplete:** Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5.

☐ **C = Incomplete:** Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3.

☐ **D = Incomplete:** Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.

☐ **E = Normal:** Motor and sensory function are normal.

CLINICAL SYNDROMES (OPTIONAL)

☐ Central Cord
☐ Brown-Sequard
☐ Anterior Cord
☐ Conus Medullaris
☐ Cauda Equina

STEPS IN CLASSIFICATION

The following order is recommended in determining the classification of individuals with SCI.

1. Determine sensory levels for right and left sides.
2. Determine motor levels for right and left sides.
   Note: in regions where there is no myotome to test, the motor level is presumed to be the same as the sensory level.
3. Determine the single neurological level.
   This is the lowest segment where motor and sensory function is normal on both sides, and is the most cephalad of the sensory and motor levels determined in steps 1 and 2.
4. Determine whether the injury is Complete or Incomplete (sacral sparing).
   If voluntary anal contraction = **No** *AND all S4-5 sensory scores* = **0** *AND any anal sensation* = **No**, *then injury is COMPLETE. Otherwise injury is incomplete.*
5. Determine ASIA Impairment Scale (AIS) Grade:

Is injury <u>Complete</u>? If **YES**, AIS=A Record ZPP
(For ZPP record lowest dermatome or myotome on each side with some (non-zero score) preservation)

NO ↓

Is injury motor <u>incomplete</u>? If **NO**, AIS=B
(Yes=voluntary anal contraction OR motor function more than three levels below the motor level on a given side.)

YES ↓

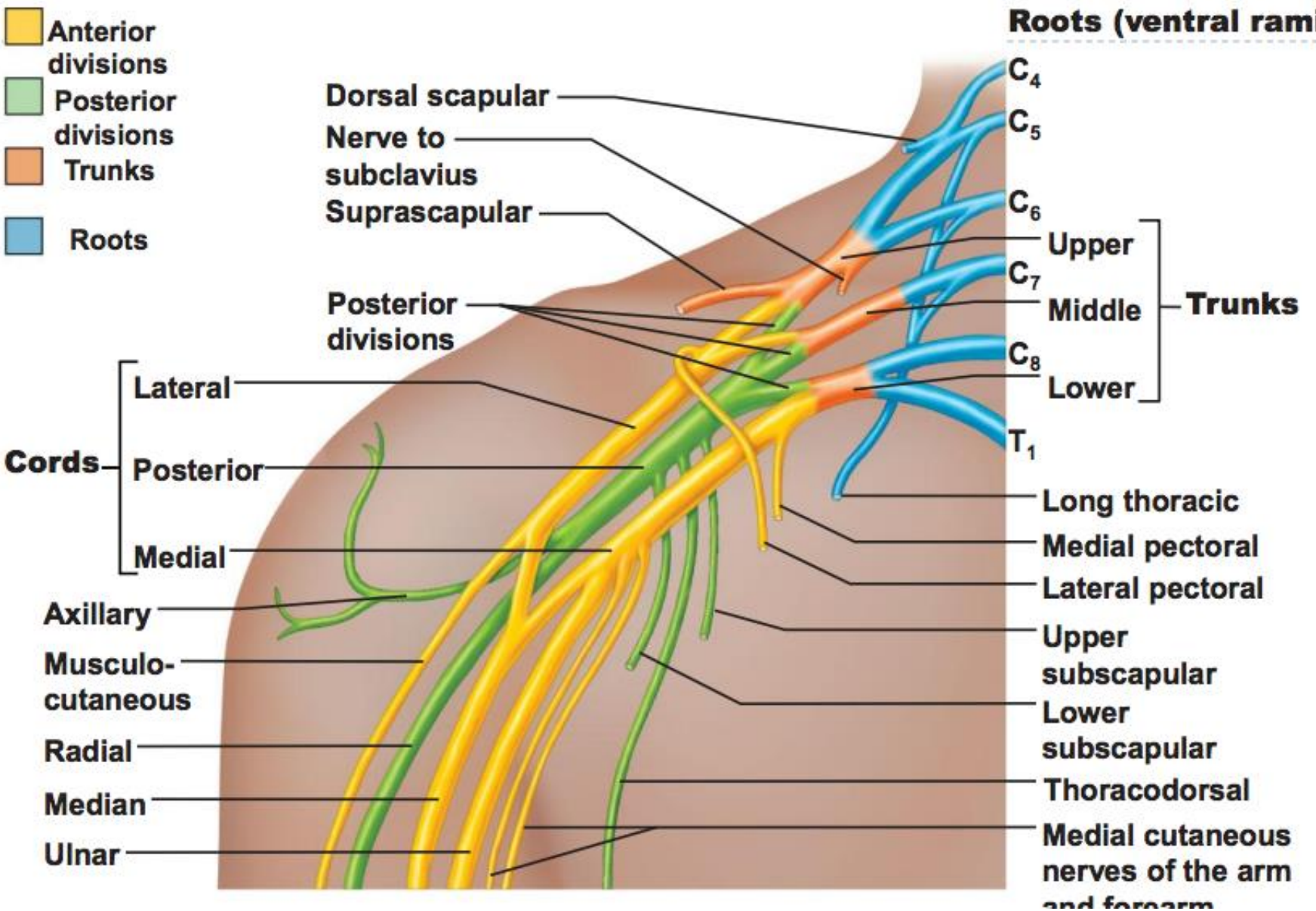
Are <u>at least</u> half of the key muscles below the (single) <u>neurological</u> level graded 3 or better?

NO ↓ AIS=C

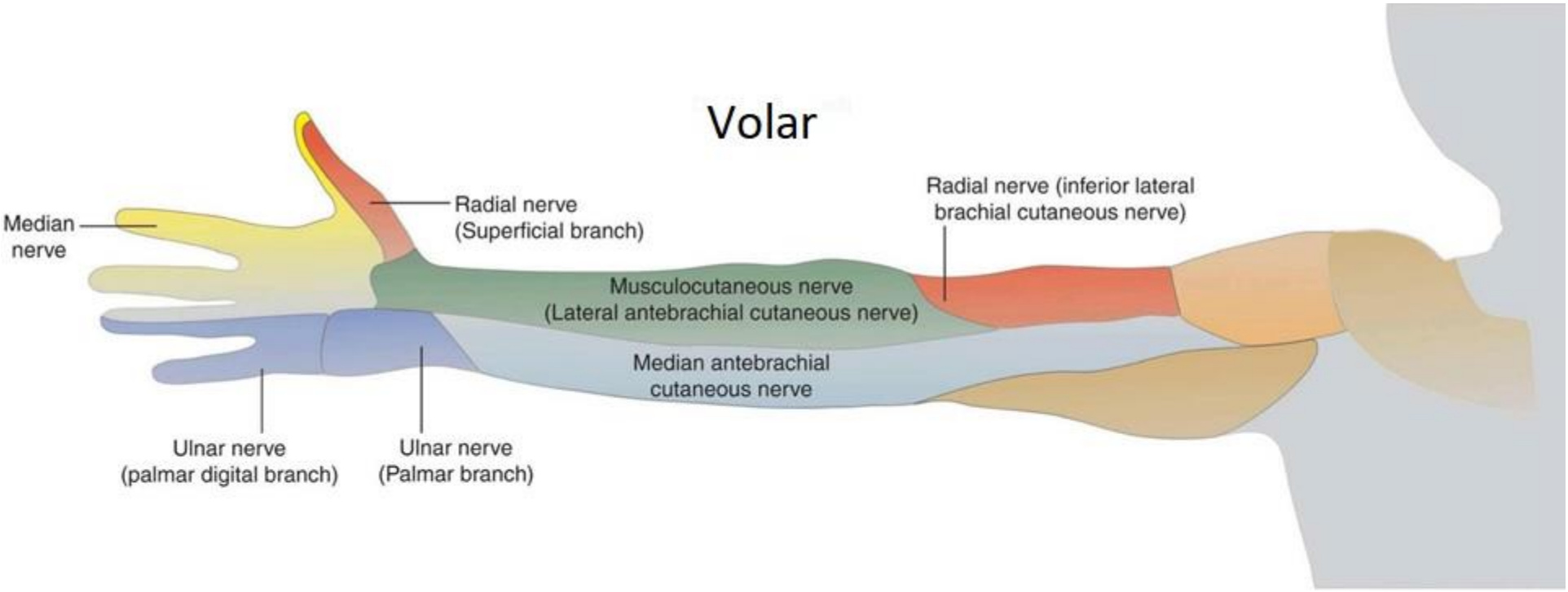
YES ↓ AIS=D

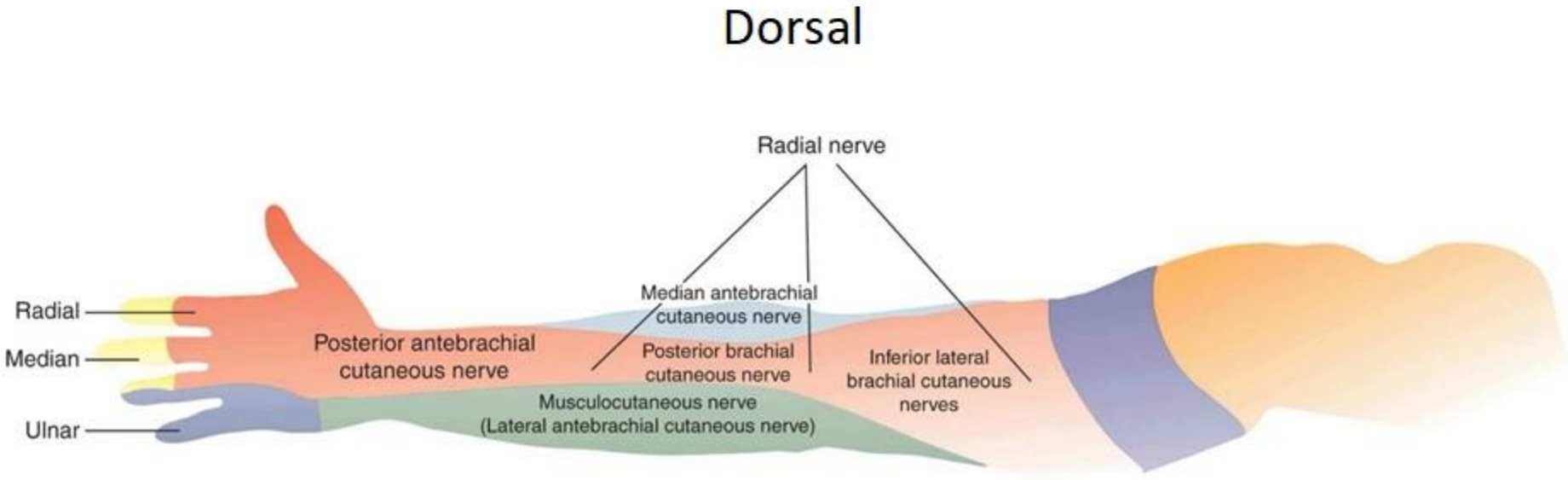
If sensation and motor function is normal in all segments, AIS=E
Note: AIS E is used in follow up testing when an individual with a documented SCI has recovered normal function. If at initial testing no deficits are found, the individual is neurologically intact; the ASIA Impairment Scale does not apply.

The Brachial Plexus

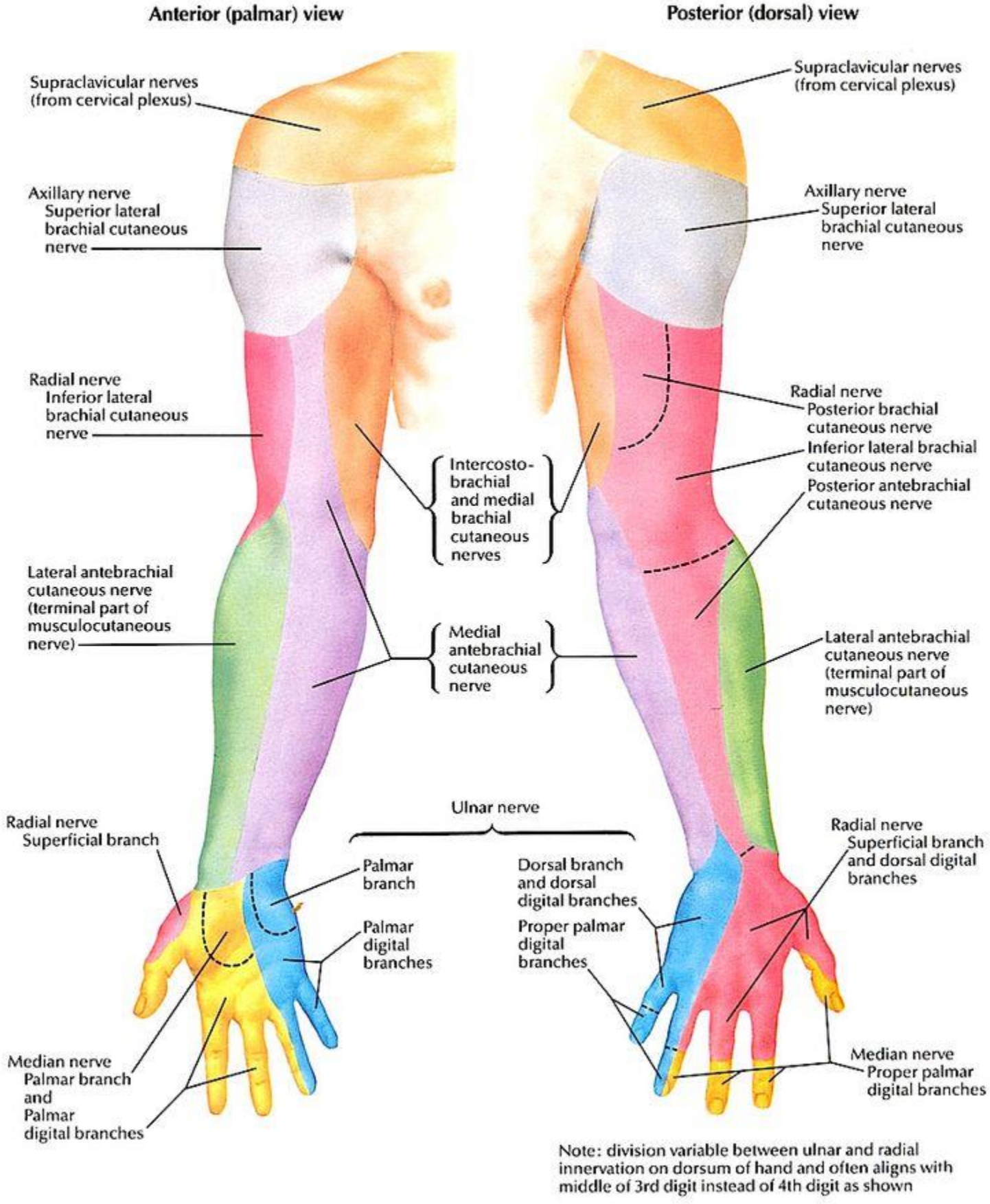


Sensory Nerve Distribution, Arm

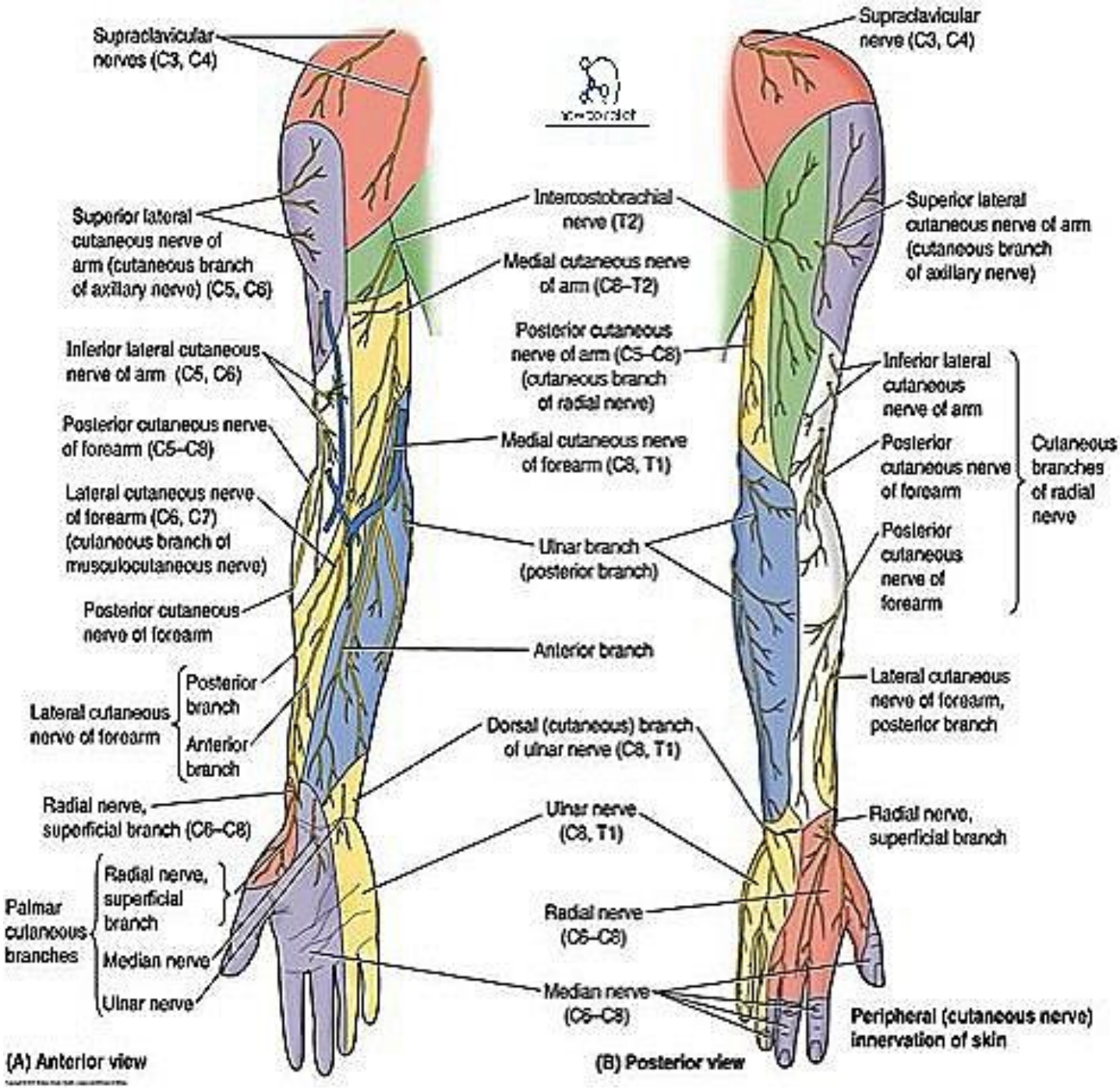




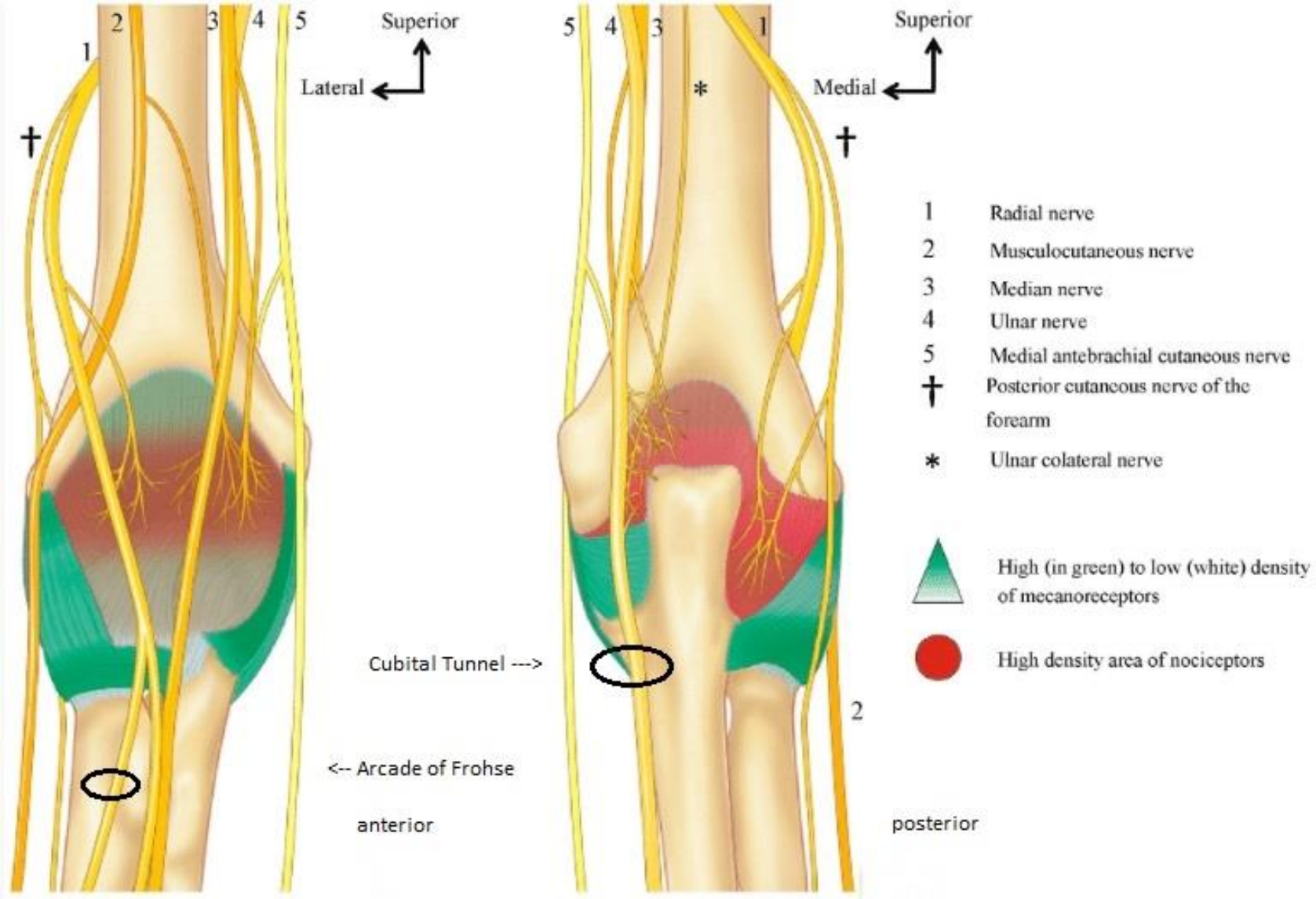
Peripheral Nerves, Arm



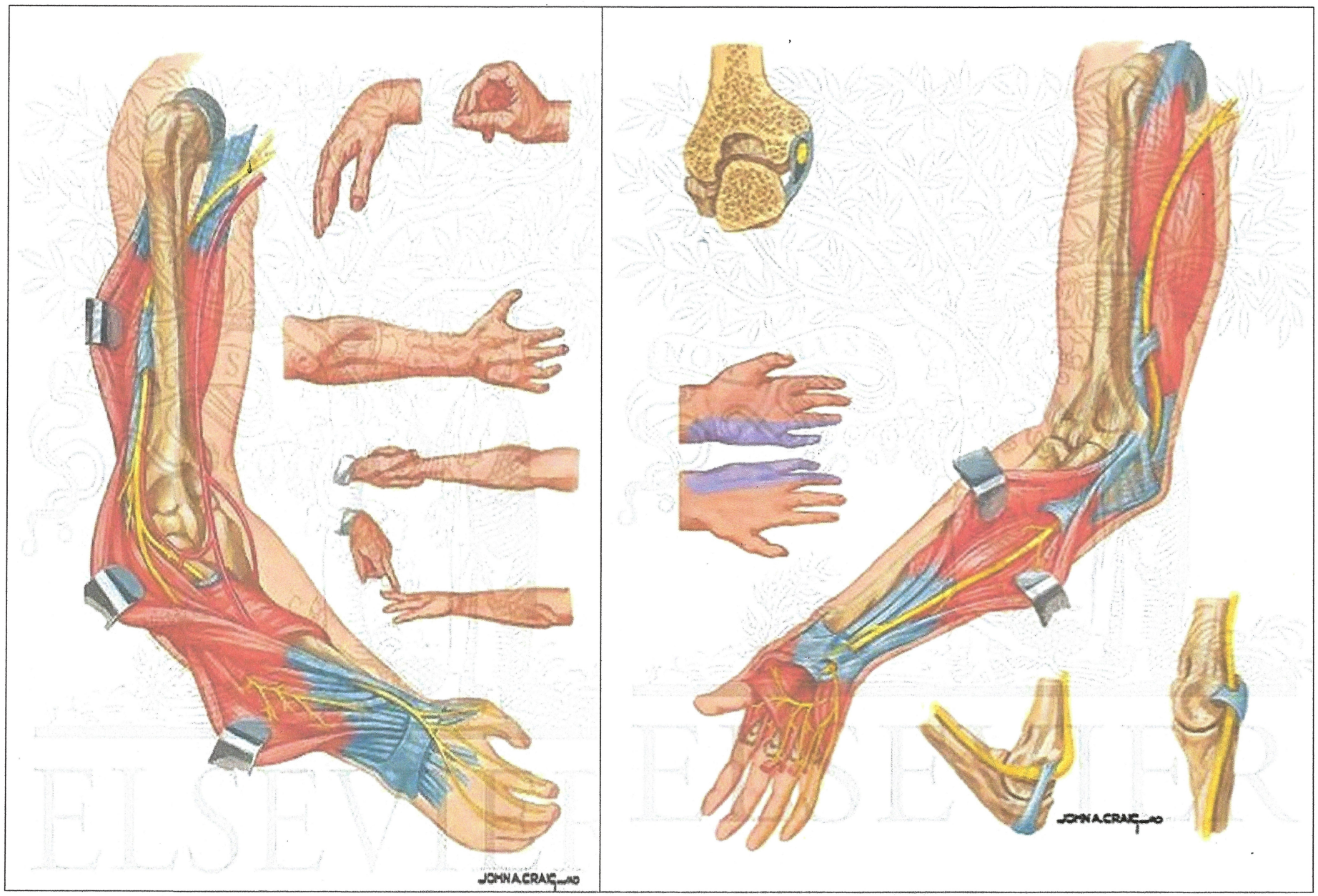
Peripheral Nerves, Arm



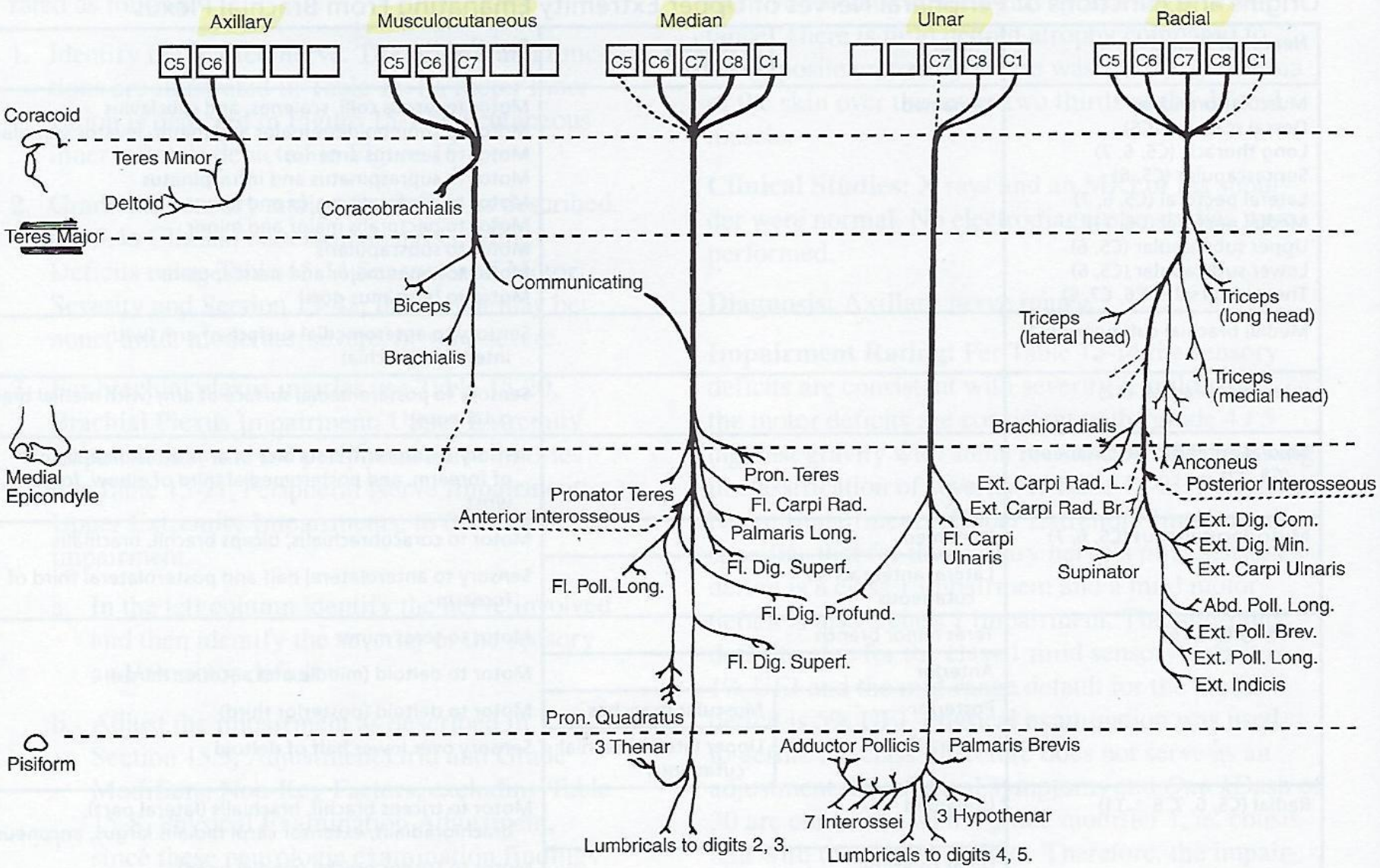
Nerves at the Elbow



Nerves of the Elbow & Forearm



Motor Innervation of the Upper Extremity

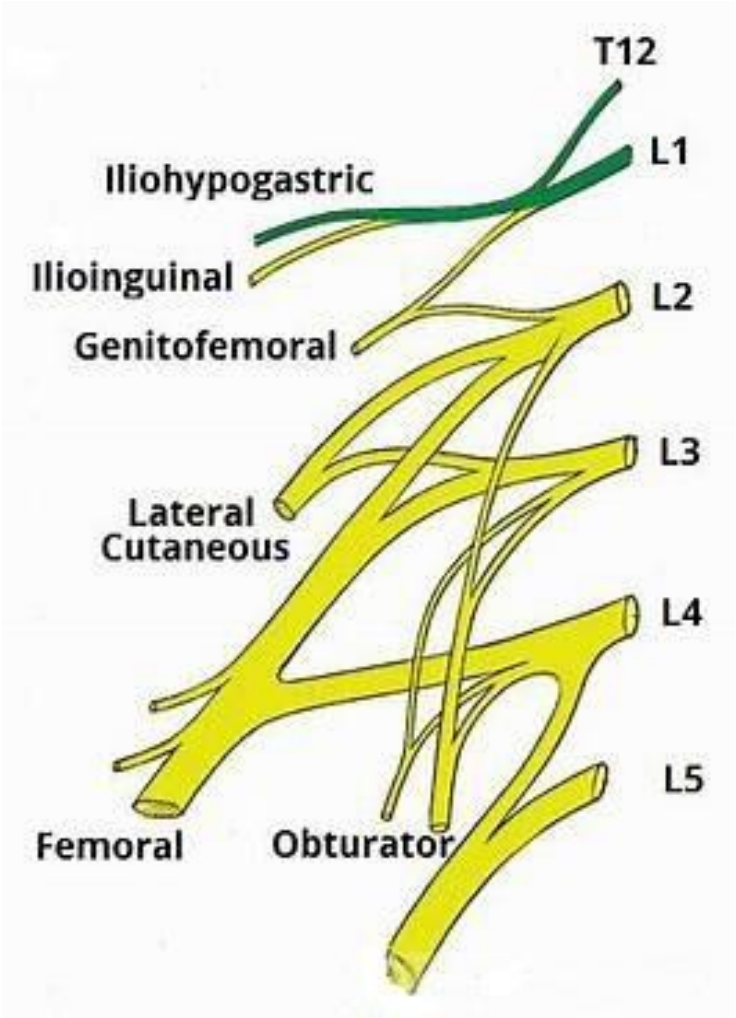


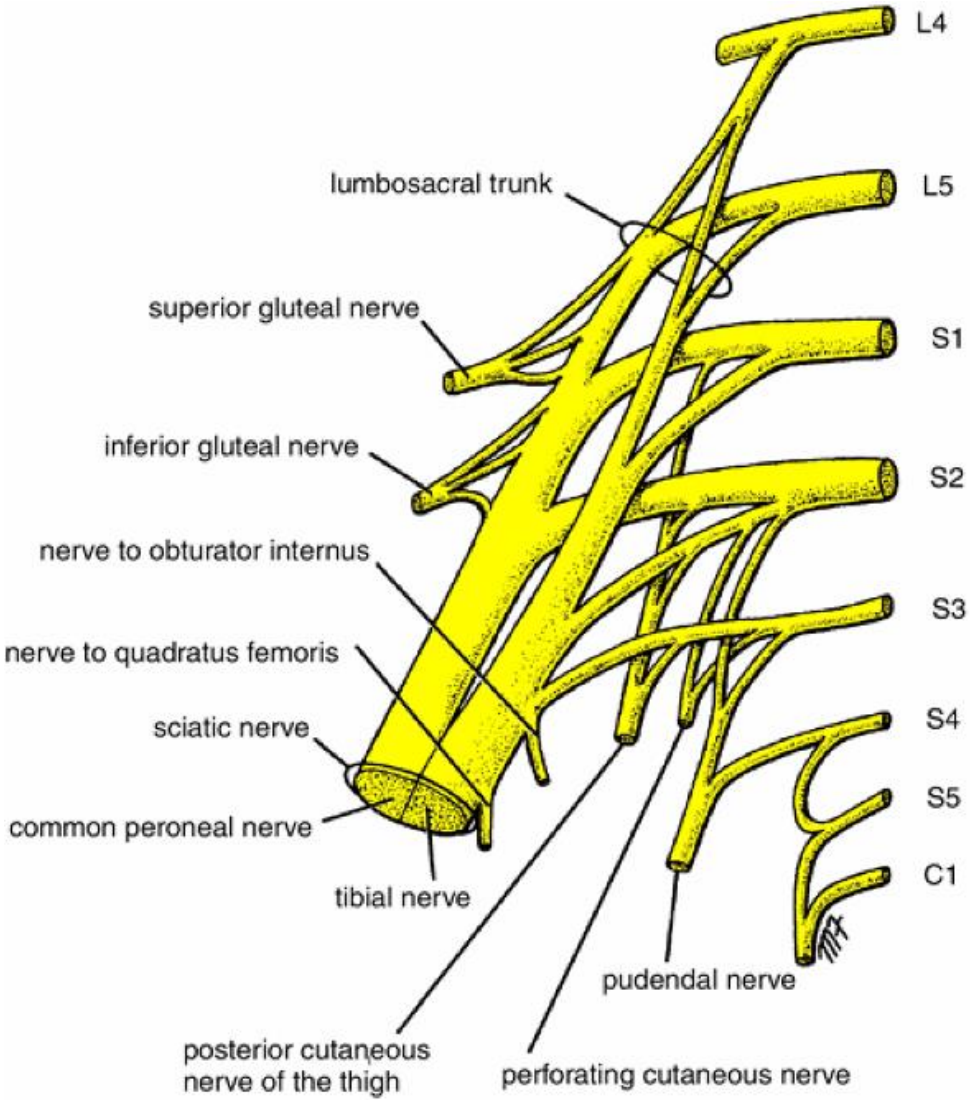
From Swanson AB, de Groot Swanson G. Evaluation of permanent impairment in the hand and upper extremity. In: Doege TC, ed. *Guides to the Evaluation of Permanent Impairment.* Fourth ed. Chicago, III: American Medical Association; 1993.

Upper

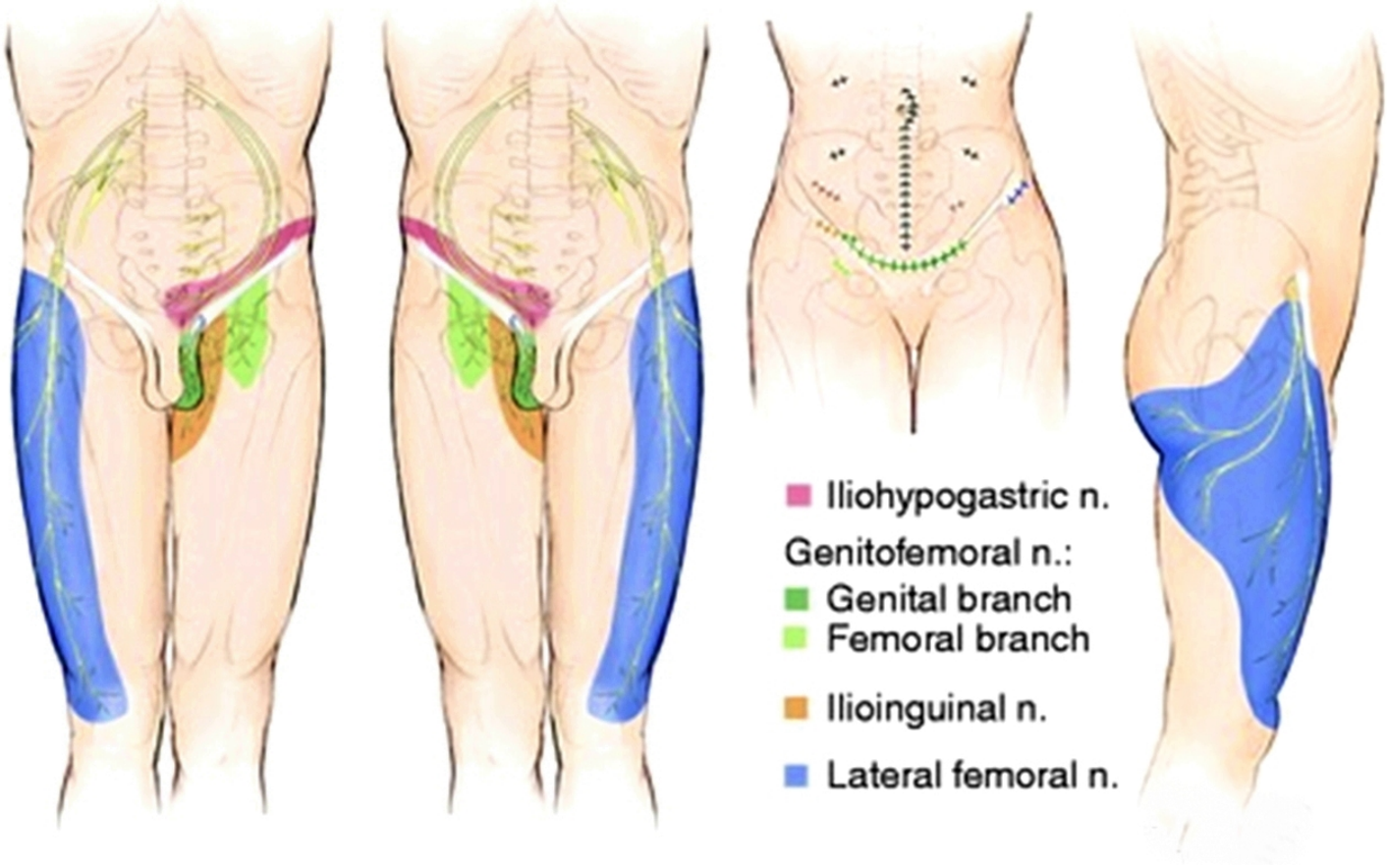
Lumbar Plexus

Lower

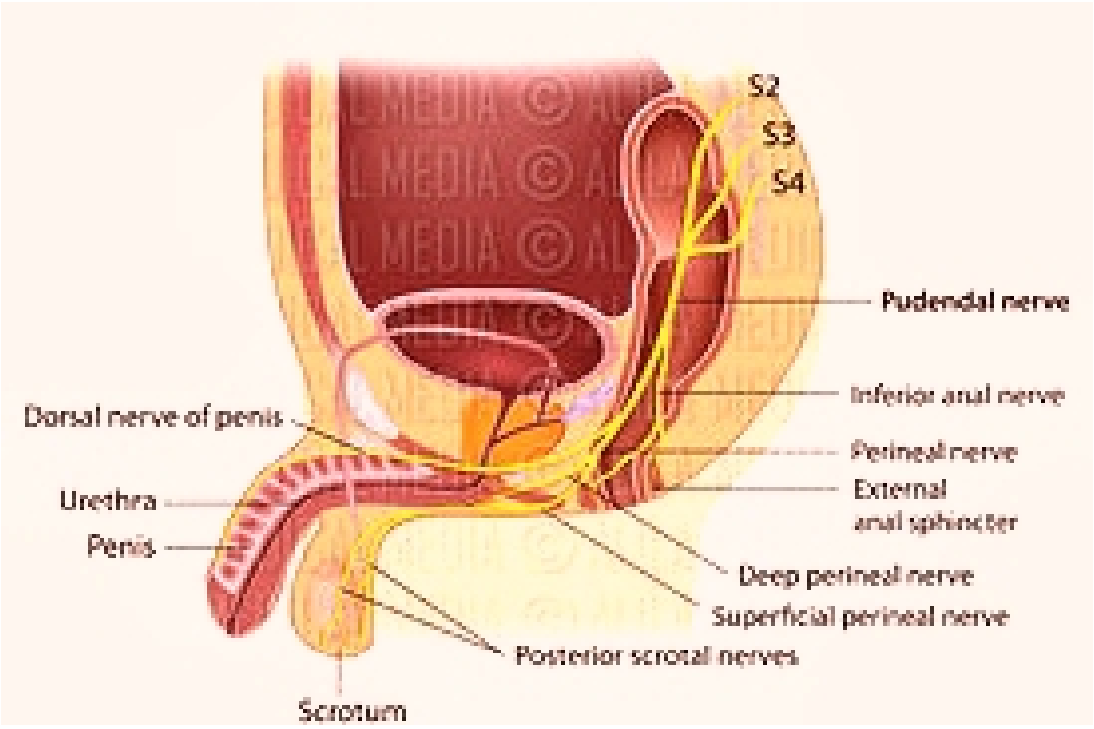




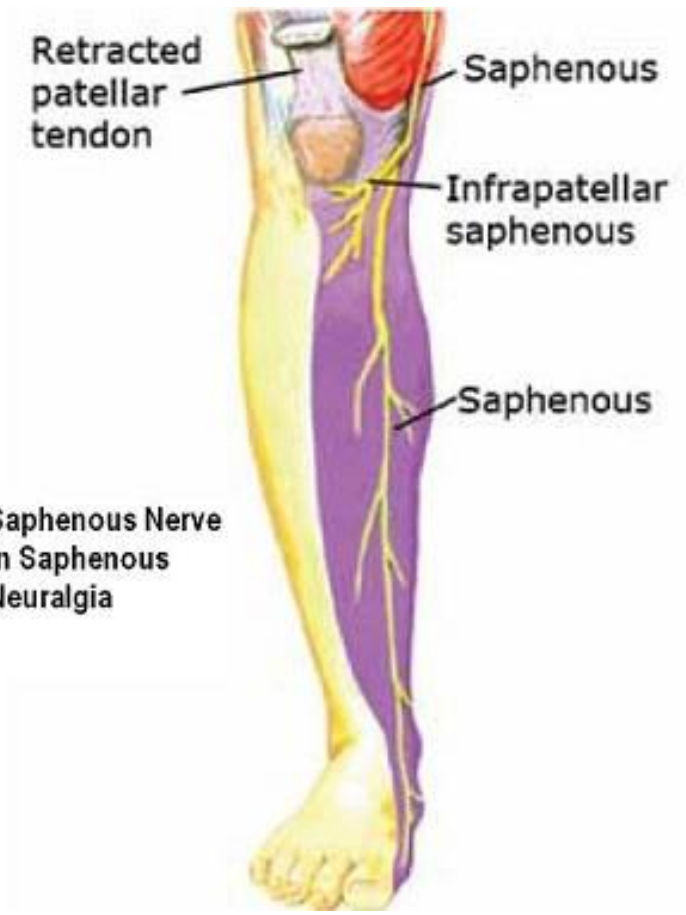
Cutaneous Nerves of the Groin and Thigh



Pudendus Nerve, Male

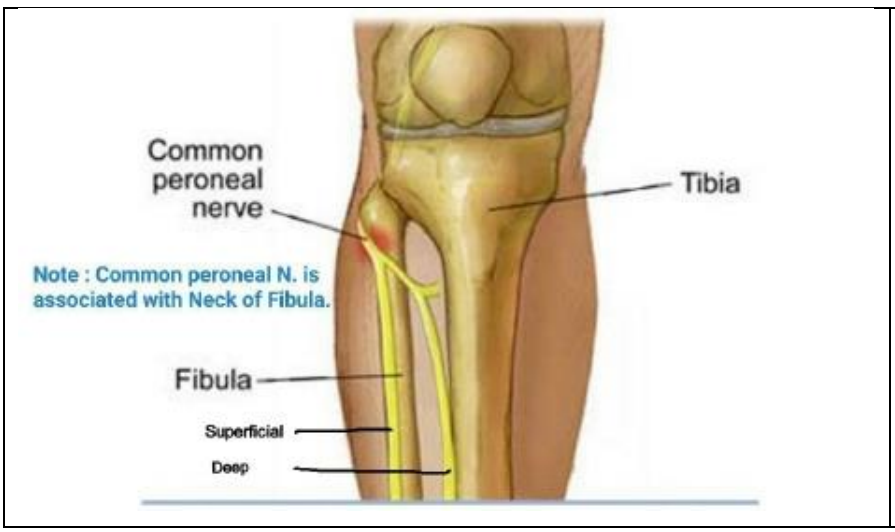


Sapheous Nerve



Saphenous Nerve in Saphenous Neuralgia

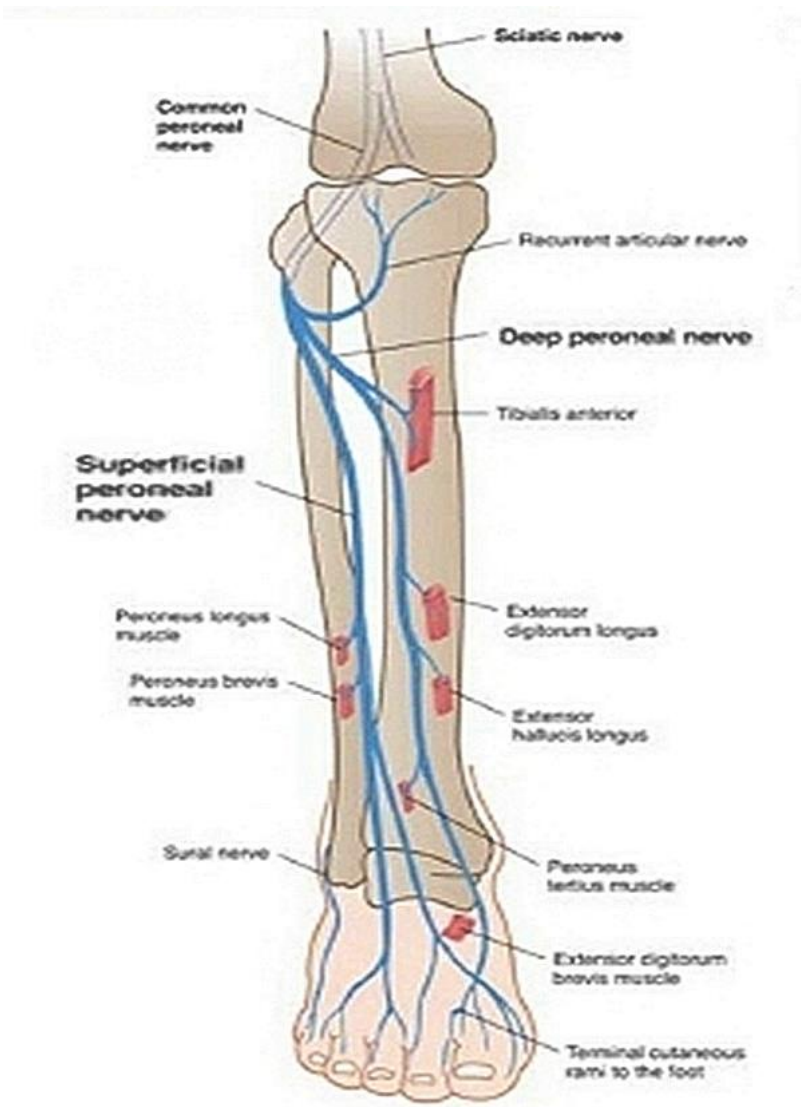
Peroneal Nerve



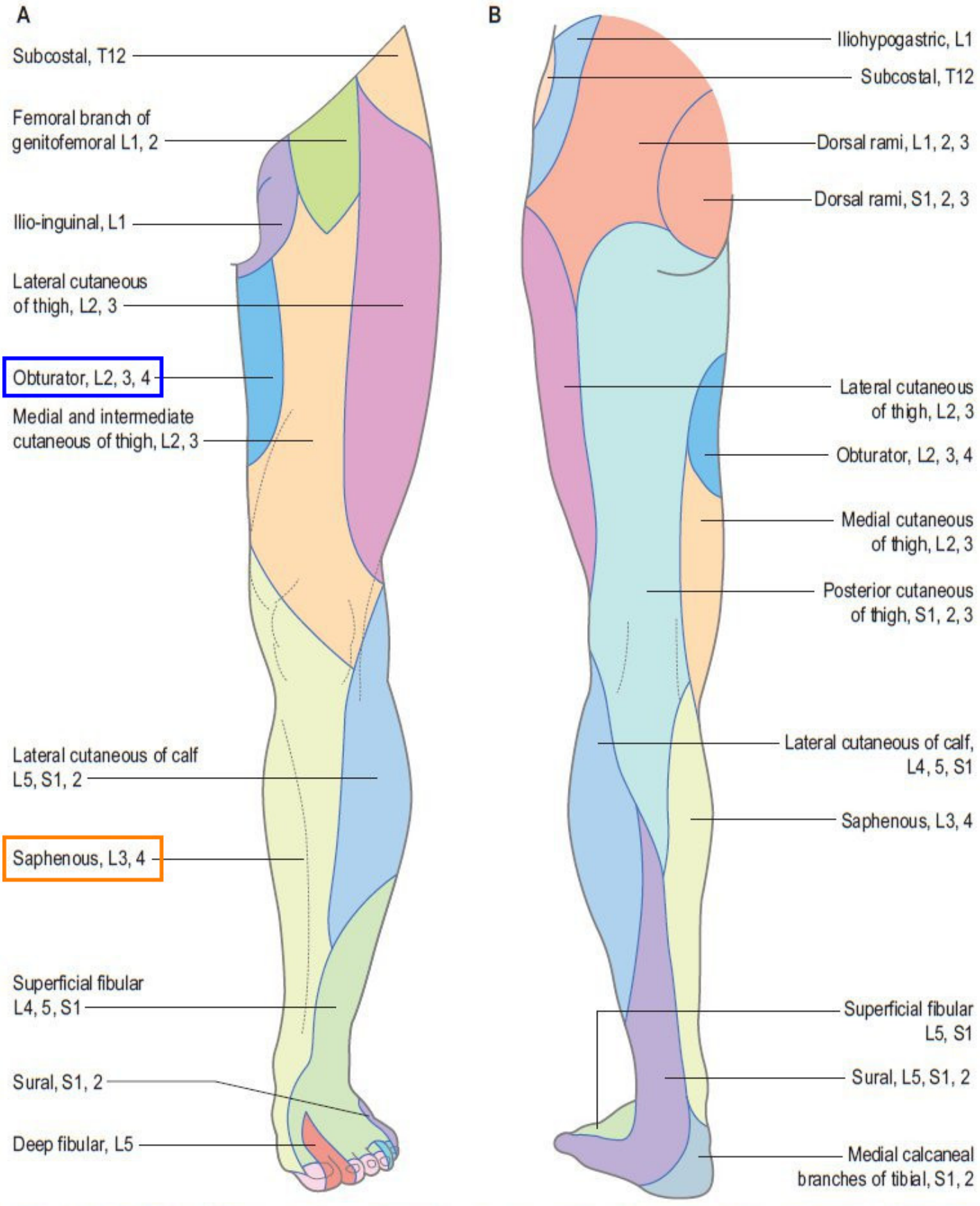
The Common Peroneal Nerve

- Superficial peroneal nerve
  - Motor functions
    - Foot eversion
- Deep peroneal nerve
  - Motor functions
    - Foot dorsiflexion, toe extension

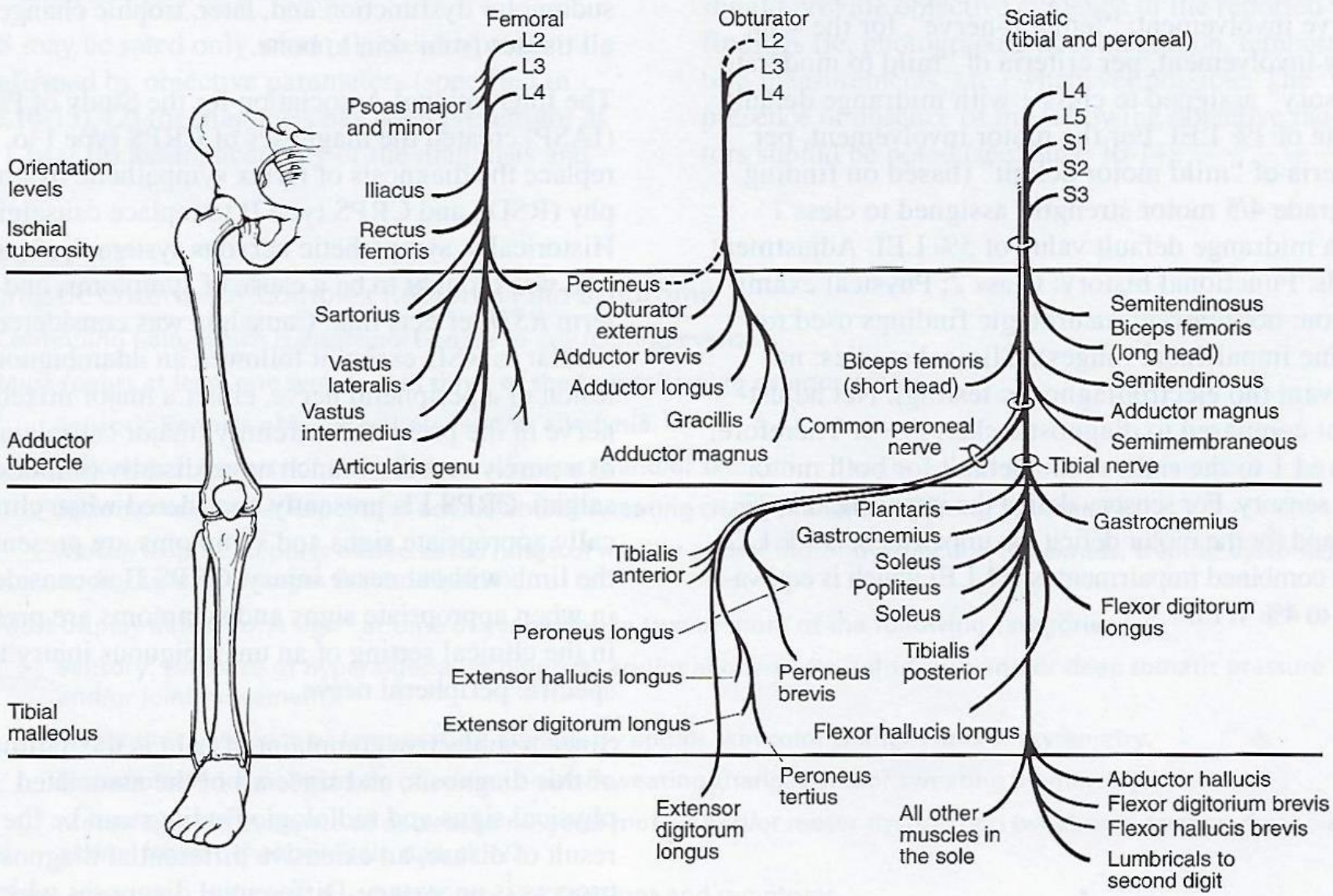
Note : Deep Peroneal N. supplies First web space of Toe.



Peripheral Nerves, Leg

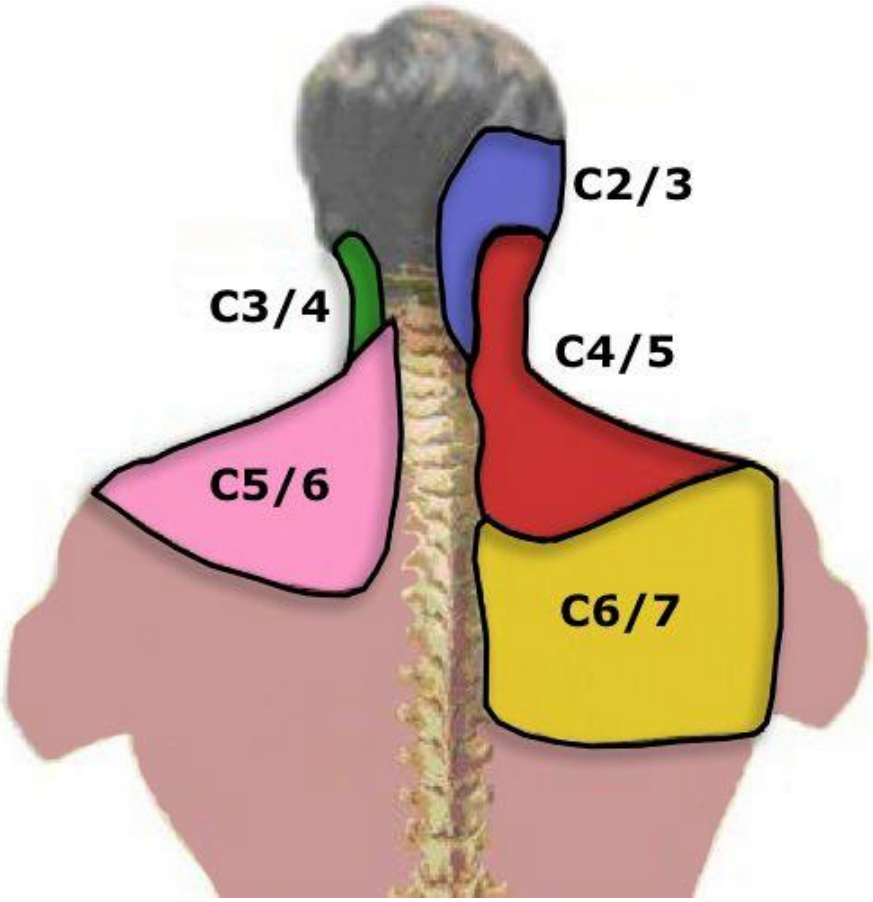


Motor Nerves of the Lower Extremity



Sclerotome Pain Referral Pattern, Neck

Facet Joint Pattern



SCLEROTOME PAIN REFERRAL PATTERNS