PERIPHERAL NERVE ANATOMY in the UPPER and LOWER EXTREMITIES

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MAJOR NERVES

• 1. Median—Motor and sensory
• 2. Ulnar—Motor and sensory
• 3. Radial—Motor and sensory
SECONDARY NERVES

- 1. Axillary—Motor only
- 2. Musculocutaneous—Motor with lateral antebrachial cutaneous nerve as terminal sensory branch
- 3. Medial antebrachial cutaneous—sensory only
- 4. Dorsal ulnar cutaneous—sensory only
MEDIAN NERVE

- 1. C5-T1 roots
- 2. Lateral and medial cords of the brachial plexus
- 3. Anterior division of upper and middle trunks
- 4. Anterior interrosseus nerve—branch of the median nerve
Median nerve--wikipedia
Median Nerve

Pronator teres

Flexor digitorum sublimis

Flexor pollicis longus

Flexor digitorum profundus

Abductor pollicis brevis

Opponens and Flexor pollicis brevis

Median Sensory NERVE
MEDIAN NERVE-INNERRVATION

• 1. Flexors of the forearm
• 2. Pronator teres—1st muscle innervated
• 3. Palmaris longus
• 4. Thenar eminence of the hand—abductor pollicis brevis (APB) and opponens pollicis
MEDIAN NERVE--PATHOLOGY

• 1. Carpal tunnel syndrome (CTS)—Most common entrapment
• 2. Pronator syndrome
• 3. Anterior interosseous nerve injury
• 4. Ligament of Struthers
MEDIAN SENSORY STUDIES

• 1. Palmars
• 2. Digits—Thumb, 2nd, or 3rd fingers
  • A. Antidromic
  • B. Orthodromic
• 3. Innervates thumb, 2nd, 3rd, and lateral ½ of 4th fingers
ULNAR NERVE

- 1. C8-T1 roots
- 2. Medial cord of brachial plexus
- 3. Lower trunk of brachial plexus
Ulnar nerve—hand--wikipedia
ULNAR NERVE--INNERVATION

• 1. Flexor carpi ulnaris
• 2. Hypothenar muscles of the hand—Abductor digiti minimi (ADM)
• 3. Interossei muscles of the hand
• 4. Flexor digitorum profundus—Dual innervation with the median nerve
ULNAR NERVE--PATHOLOGY

• 1. Palm
• 2. Wrist—Canal of Guyon
• 3. Elbow—Cubital tunnel/tardy ulnar palsy
• 4. Axilla—Thoracic outlet syndrome (TOS)
ULNAR SENSORY STUDIES

• 1. Palmars
• 2. Digits—5th digit
• 3. Innervates 5th finger and medial aspect of 4th finger
• 4. Dorsal ulnar cutaneous nerve—Sensory branch proximal to canal of Guyon
DORSAL ULNAR CUTANEOUS

1. Purely sensory nerve
2. Exits ulnar trunk 5-8 cm proximal to the canal of Guyon at the wrist
3. Supplies sensation to the medial 4th and dorsal 5th digits AND the dorsal medial hand
RADIAL NERVE

- 1. C5-T1 roots
- 2. Posterior cord of brachial plexus
- 3. Posterior divisions of all 3 trunks
- 4. Sensation to the dorsum of forearm and hand
Radial nerve--wikipedia
Radial Nerve
Triceps
Brachioradialis
Extensor carpi radialis
Supinator
Extensor digitorum
Extensor digiti quinti
Extensor carpi ulnaris
Superficial radial nerve
Abductor pollicis
Extensor pollicis
Extensor indicis proprius
RADIAL NERVE--INNERVATION

• 1. Triceps
• 2. Forearm and finger extensors
• 3. Supinator
RADIAL NERVE--PATHOLOGY

- 1. Wrist—Handcuff palsy
- 2. Posterior interosseus syndrome
- 3. Spiral groove—Honeymoon palsy/Saturday night palsy
RADIAL SENSORY STUDIES

1. Located at the anatomic “snuff box” on the dorsum of the hand
2. Stimulation site—Forearm
3. Good 3rd sensory study
AXILLARY NERVE

- 1. C5-6 roots
- 2. Posterior cord of brachial plexus
- 3. Upper trunk
- 4. Motor study only
Axillary nerve--wikipedia
AXILLARY NERVE INNERVATION

• 1. Deltoid
• 2. Teres Minor
MUSCULOCUTANEOUS NERVE and LATERAL ANTEBRACHIAL CUTANEOUS NERVE

- 1. C5-6 roots
- 2. Upper trunk, anterior division, lateral cord of the brachial plexus
- 3. Becomes lateral antebrachial cutaneous sensory nerve supplying the lateral aspect of the forearm
Musculocutaneous nerve--wikipedia
Musculocutaneous Nerve
Coracobrachialis
Biceps
Brachialis
Lateral cutaneous nerve
MUSCULOCUTANEOUS--INNERVATION

- 1. Biceps
- 2. Coracobrachialis
- 3. Brachialis
MEDIAL ANTEBRACHIAL CUTANEOUS NERVE

• 1. Pure sensory nerve
• 2. C8-T1 roots
• 3. Lower trunk, medial cord of the brachial plexus
• 4. Provides sensation to medial aspect of the forearm
• 5. Used in lower trunk brachial plexus injuries--TOS
MARTIN GRUBER ANASTOMOSIS

1. Fibers from median nerve reroute in the forearm and travel with the ulnar nerve
2. Fibers end at the ulnar innervated hand muscles—ADM, FDI, and FPB
3. Proximal median amplitude is higher than distal amplitude
3 TYPES OF CROSSOVERS

• 1. Median to ADM—Most common
• 2. Median to FDI
• 3. Median to FPB
LUMBAR PLEXUS

1. L1-L5—Ventral rami
2. L2-L4—Femoral nerve
3. L2-L3—Lateral femoral cutaneous nerve
4. Combines with sacral plexus to form lumbosacral plexus
SACRAL PLEXUS

• 1. Lumbar trunk (L4-5) combined with S1-S3 roots
• 2. L4-L5—Gluteal nerves
• 3. L4-L5 and S1-S3—Sciatic nerve
  • a. Fibular-Motor and sensory
  • b. Tibial-Motor and sensory
MAJOR NERVES

• 1. Sciatic
  a. Fibular=Peroneal—Motor
  b. Tibial—Motor
• 2. Sural—Pure sensory
• 3. Superficial fibular—Motor and sensory
SECONDARY NERVES

• 1. Femoral—Motor component
• 2. Lateral femoral cutaneous—Pure sensory nerve
• 3. Saphenous—Sensory branch of the femoral nerve
• 4. Medial and lateral plantars—Sensory branches of the tibial nerve
SCIATIC NERVE

• 1. L4-S3 roots
• 2. Innervates the psoas muscle and the hamstring group of muscles—Biceps, short & long heads
• 3. Courses down the back of the thigh
• 4. Divides just above the popliteal fossa at the knee to form the fibular and tibial nerves
COMMON FIBULAR NERVE

- 1. L4-L5 roots
- 2. Sacral plexus
- 3. Formed just above the popliteal fossa as the sciatic bifurcates
- 4. Divides at the fibular head to form the deep fibular and the superficial fibular nerves
DEEP FIBULAR NERVE--INNERVATION

• 1. Anterior tibial (AT)—Secondary recording site
• 2. Extensor hallucis longus
• 3. Extensor digitorum longus
• 4. Extensor digitorum brevis (EDB)—Primary recording site
DEEP FIBULAR NERVE--PATHOLOGY

• 1. Lesions at the fibular head—Most common point of entrapment—Crossed leg palsy
• 2. Lesions on the dorsum of the foot—Anterior tarsal tunnel syndrome--RARE
• 3. Anatomic variant—Accessory fibular
SUPERFICIAL FIBULAR

1. Sacral plexus
2. L5-S1 roots
3. Branches from fibular at the fibular head
4. Motor and sensory components
Common peroneal nerve

Deep peroneal nerve

Superficial peroneal nerve

Peroneus longus

Peroneus brevis

Cutaneous branch

Superficial peroneal nerve
SUPERFICIAL FIBULAR--INNERVATION

• 1. Motor to the peroneus longus and brevis muscles
• 2. Sensory to the dorsum of the foot and anterolateral foreleg
• 3. Good 2nd sensory study
TIBIAL NERVE

- 1. Sacral plexus
- 2. L5-S2 roots
- 3. Branch of the sciatic nerve
- 4. Courses down the back of the leg to the bottom of the foot
TIBIAL NERVE--INNERVATION

• 1. Flexors of the foot
• 2. Gastrocnemius
• 3. Soleus
• 4. Abductor hallucis (AH)
• 5. Abductor digiti quinti pedis (ADQP)
• 6. Interrossei of the foot
TIBIAL NERVE--PATHOLOGY

• 1. Popliteal fossa—Trauma
• 2. Tarsal tunnel at the ankle
  • a. Fairly common
  • b. Must rule out other diseases 1st
  • c. Side to side comparison
SURAL NERVE

• 1. Sacral plexus—S1 root
• 2. Provides sensation to the lateral lower leg
• 3. Has both fibular and tibial fibers
Abductor hallucis

Medial

Dorsal and lateral

Abductor digitii quinti pedis

Sural nerve

Flavor digitorum

Flavor hallucis longus

Tibialis posterior

Tibial nerve

Popliteus

Soleus

Gastrocnemius

Common peroneal nerve
FEMORAL NERVE

1. Lumbar plexus—L2-L4
2. Innervates the quadriceps muscles
   a. Vastus lateralis, medialis, intermedius, and rectus femoris
3. Becomes the saphenous sensory nerve distally
4. Pathology usually occurs at the femoral triangle
SAPHENOUS NERVE

• 1. L3-L4 roots
• 2. Distal sensory branch of the femoral motor nerve
• 3. Innervates the medial aspect of the leg and foot
• 4. Proximal and distal study techniques
LATERAL FEMORAL CUTANEOUS NERVE

• 1. L2-L3 roots
• 2. 1st sensory branch of the lumbar plexus
• 3. Innervates the posterior and anterior thigh
• 4. Disease process—Meralgia paresthetica
• 5. DIFFICULT TO OBTAIN
Lateral femoral cutaneous nerve

Obturating nerve

Adductors

Gracilis
MEDIAL AND LATERAL PLANTAR NERVES

• 1. Distal sensory branches of the tibial motor nerve
• 2. Innervates the sole of the foot
• 3. Used in tarsal tunnel syndrome studies
• 4. Orthodromic study--Side to side comparison
Tibial Nerve

Medial plantar nerve

Lateral plantar nerve
ACCESSORY FIBULAR

• 1. Anatomic variant in the lower extremities

• 2. Fibers leave fibular nerve just distal to the fibular head, course along the lateral edge of the leg, and go under the lateral malleolus to innervate the EDB

• 3. Amplitude proximally >distally with supramaximal stimulation