Session 2: Key Muscles & Associated Neurovasculature

Part 1: Upper Limb

1.1 Axilla

Describe the relationships between the brachial plexus and other structures in the axilla.

- The brachial plexus is posterosuperior to the axillary artery, and the axillary artery is posterosuperior to the axillary vein.

What are the muscular landmarks of the axillary space?

- The posterior border of the axillary space is the latissimus dorsi m. and the anterior border of the axillary space is the pectoralis major m. The medial wall is the ribcage while the lateral wall is the humerus (and its associated musculature). The superior roof is formed from the clavicle, scapula, and first rib.

1.2 Cubital Fossa

What are the actions of the anterior and posterior arm muscles?

- Acting on the shoulder and/or elbow, anterior arm muscles flex while posterior arm muscles extend (generally)

What is the innervation of each compartment of the arm?

- The anterior arm compartment is served via the musculocutaneous nerve while the posterior compartment is served via the radial nerve.

Which muscular landmarks could be used to identify the median cubital v.?

- The boundaries of the cubital fossa are the following
    - Laterally -> medial border of brachioradialis m.
    - Medially -> lateral border of pronator teres
    - Superiorly -> line between the epicondyles of humerus (just distal to the bulk of the biceps)

1.3 Wrist

What are the actions of the anterior and posterior forearm muscles?

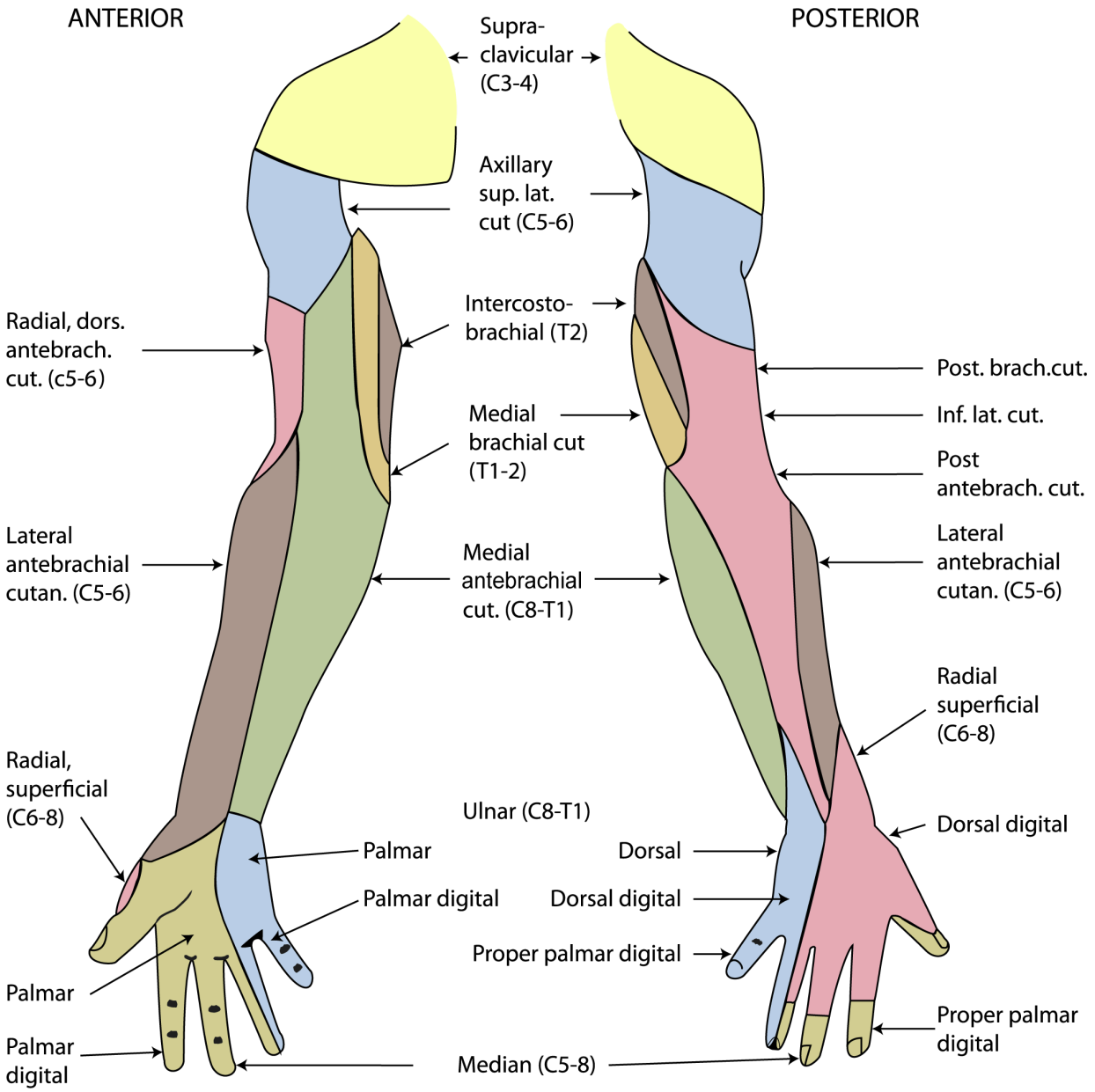
- Acting on the radioulnar joint, wrist, and digits, the anterior forearm muscles flex or pronate while the posterior muscles extend or supinate (generally)

Which regions of the forearm and hand are innervated by the median, ulnar, and radial nn.?

- Motor

- Median n.: most of anterior forearm muscles and thenar muscles
- Ulnar n.: 1.5 anterior forearm muscles (flexor carpi ulnaris and medial half of flexor digitorum profundus m.) and most intrinisic hand muscles
- Radial n.: All posterior forearm muscles

- Sensory (see image below – public domain from Gray's Anatomy)
  - Median n.: anterior lateral hand (palm, digits 1, 2, 3, and half of 4) and posterior tips of fingers (digits 1, 2, 3, and half of 4)
  - Ulnar n.: medial hand (medial palm and posterior hand, anterior and posterior aspects of digit 4 and half of digit 5
  - Radial n.: posterior lateral hand (posterior hand, digits 1, 2, 3, and half of 4 – not including fingertips



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Part 2: Lower Limb

2.1 Hip

Which muscle divides the greater sciatic foramen?

- Piriformis m.

2.2 Femoral Triangle

What are the actions of the anterior and medial thigh muscles?

- The anterior muscles flex at the hip and extend at the knee while the medial muscles adduct at the hip (generally)

Which nerve innervates each compartment?

- The anterior compartment is innervated by the femoral n. while the medial compartment is innervated by the obturator n.

2.3 Popliteal Fossa

What are the actions of the posterior thigh muscles?

- The posterior thigh muscles extend at the hip and flex at the knee

What is the innervation of this compartment?

- Sciatic n.

2.4 Ankle

What are the actions of the anterior, lateral, and posterior leg muscles?

- Anterior mm. dorsiflex & invert the foot at the ankle and extend digits, lateral mm. evert or turn the sole of the foot outward, posterior mm. plantar flex & invert the foot at the ankle and flex digits

What is the innervation of each compartment?

- Anterior innervation is deep fibular (peroneal) n., lateral innervation is superficial fibular (peroneal) n., and posterior innervation is tibial n. (terminal branches of sciatic)

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Part 3: TMJ & Muscles of Mastication

3.1 Osteology

Which muscles attach to these bony features?

- Lateral pterygoid plate -> Medial and lateral pterygoid mm.
- Coronoid process -> Temporalis m.
- Mandibular condylar apparatus -> TMJ capsule and lateral pterygoid m.
- Ramus and angle of the mandible -> Masseter and medial pterygoid mm.

3.2 Masseter & Temporalis mm.

Which features come together to form the TMJ?

- Mandibular condyle and mandibular fossa come together (with surrounding capsular structures) to form the TMJ

Describe the actions of the temporalis and masseter mm.

- Both muscles close the jaw. Masseter primarily elevates while the temporalis elevates and retracts.

3.3 Zygomatic Arch

Which two bones form the zygomatic arch?

- Zygomatic bone and temporal bone

3.6 Lateral & Medial Pterygoid mm.

Describe the actions of the lateral and medial pterygoid mm.

- The medial pterygoid mirrors the actions of the masseter m. and elevates the mandible. The lateral pterygoid is the only “opener” of the jaw (depression) and technically protrudes, abducts, and allows mediotrusive movement of the mandible.

3.7 TMJ Articular Capsule

Describe a dislocation of the TMJ.

- This is an instance where the condyle of the mandible moves anteriorly past the articular tubercle and out of the mandibular fossa (a.k.a. glenoid fossa)

3.8 TMJ Articular Disc

Which movements take place in the superior and inferior compartments of the TMJ?

- Translation (protrusion/protraction & retrusion/retraction) happens superiorly, and rotational movement (elevation & depression) happens inferiorly

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Part 4: Deep Face

4.1 Osteology

Describe the structures that course through these bony features of the skull base.

- Foramen ovale -> CN V_3, foramen spinosum -> middle meningeal a., petrotympanic fissure -> chorda tympani n.

4.2 Pterygoid Venous Plexus

Describe the veins of the head that communicate with the pterygoid plexus of veins.

- Deep midface veins (e.g. spenopalatine, deep temporal, pterygoid, masseteric, buccal, alveolar, palatine) as well as ophthalmic and meningeal vv.

4.3 Maxillary a.

Describe location of the three parts of maxillary artery. What regions are supplied by each part?

- Mandibular (first) part is posterior to the lateral pterygoid mm. and supplies ear region, meninges, and mandible
- Pterygoid (second) part is medial or lateral to the lateral pterygoid m. and supplies masticator mm.
- Pterygopalatine (third) part is anterior to the lateral pterygoid and supplies the deep face by traveling through the pterygomaxillary fissure.

4.4 CN V3

What do the inferior alveolar and lingual nn. innervate?

- The IAN serves the mandible and mandibular teeth afferently and the lingual n. serves the oral cavity afferently (region of gingiva, floor of mouth, and tongue).

Which fiber types run with chorda tympani?

- The chorda tympani n. is carrying preganglionic parasympathetic fibers to the submandibular ganglion as well as taste fibers from the anterior two thirds of the tongue.

4.5 Otic Ganglion

Describe the location of the otic ganglion and the salivary gland pathway associated with it.

- The otic ganglion is found just deep to the fibers of V3 as they exit the skull via the forman ovale.

From Head and Neck Anatomy: An Introduction and Laboratory Guide – David Brzezinski, MD, CGS

- *"The glossopharyngeal nerve (CN IX) arises from the medulla and leaves the skull via the jugular foramen. Its primary role is to afferently serve the posterior portion of the pharynx.*
- *Immediately following its exit from the skull, a small set of fibers (the tympanic nerve) split off from the glossopharyngeal nerve. These fibers travel superiorly right back up into the skull through the tympanic canaliculus (found directly between the jugular foramen and the carotid canal).*
- *These preganglionic parasympathetic fibers travel through the middle ear space before leaving the temporal bone of the skull by means of the lesser petrosal nerve. The lesser petrosal nerve then travels over the internal skull base before exiting through the foramen ovale adjacent to the mandibular branch of the trigeminal nerve.*
- *The preganglionic fibers then synapse in the otic ganglion which is found immediately medial to the trunk of mandibular branch of the trigeminal nerve after it has exited the skull base.*
- *Postganglionic fibers exit the otic ganglion and hitch a ride on the auriculotemporal nerve before finally jumping off in the substance of the parotid gland to innervate it."*

4.6 Pterygopalatine Fossa Openings

Which structure enters the pterygopalatine fossa through the pterygomaxillary fissure?

- Maxillary artery