

Question:

Which of the following nerves may be entrapped as it travels with the brachial artery beneath Struthers' ligament as it passes from the supracondylar process to the humerus?

Answers:

- A. Median nerve
- B. Ulnar nerve
- C. Axillary nerve
- D. Musculocutaneous nerve
- E. Radial nerve

Correct Answer:

Correct Answer: Median nerve

Discussion:

The median nerve travels with the brachial artery under struthers ligament in the distal humerus. Compression represents a less common median nerve entrapment causing pain in the forearm and hand. The radial, ulnar, axillary, and musculocutaneous nerves do not pass beneath struthers ligament. The arcade of struthers and struther's ligament are two different anatomic structures. The arcade of struthers is an aponeurotic structure that extends from the medial intermuscular septum to the medial head of the biceps. The arcade of struthers can cause compression of the ulnar nerve proximal to the typical entrapment point of the cubital tunnel.

References:

Entrapment Neuropathies of the Upper Extremity. Doughty CT, Bowley MP. *Med Clin North Am*. 2019 Mar;103(2):357-370. doi: 10.1016/j.mcna.2018.10.012. PMID:30704687

Mizia E, Zarzecki MP, Pekala JR, Baginski A, Kaythampillai LN, Golebiowska M, Pekala PA, Walocha JA, Tomaszewski KA. An anatomical investigation of rare upper limb neuropathies due to the Struthers' ligament or arcade: a meta-analysis. *Folia Morphol (Warsz)*. 2020 May 12. doi: 10.5603/FM.a2020.0050. Epub ahead of print. PMID: 32394418.

Question:

The long thoracic nerve typically arises from which of the following cervical spinal nerves?

Answers:

- A. C3, C4, C5
- B. Spinal accessory nerve, C2, C3
- C. C5, C6, C7
- D. C4, C5, C6

E. Spinal accessory nerve, C3, C4

Correct Answer:

Correct Answer:

C5, C6, C7

Discussion:

The long thoracic nerve originates from the superior trunk of the brachial plexus and typically receives contributions from cervical nerve roots C5, C6, and C7. It is responsible for the innervation of the serratus anterior muscle; injury results in winging of the scapula.

References:

Anatomy, Etiology, and Management of Scapular Winging. Didesch JT, Tang P.J Hand Surg Am. 2019 Apr;44(4):321-330. doi: 10.1016/j.jhsa.2018.08.008. Epub 2018 Oct 3.
Tubbs, R. Shane; Goodrich, Dylan; Watanabe, Koichi; Loukas, Marios (January 1, 2015), Tubbs, R. Shane; Rizk, Elias; Shoja, Mohammadali M.; Loukas, Marios (eds.), "Chapter 43 - Anatomic Landmarks for Selected Nerves of the Head, Neck, and Upper and Lower Limbs", Nerves and Nerve Injuries, San Diego: Academic Press, pp. 575–588, doi:10.1016/b978-0-12-410390-0.00045-7, ISBN 978-0-12-410390-0, retrieved October 25, 2020

Question:

Which of the following nerves passes through the quadrangular space below the teres minor?

Answers:

- A. Long Thoracic Nerve
- B. Thoracodorsal Nerve
- C. Radial Nerve
- D. Axillary Nerve
- E. Suprascapular Nerve

Correct Answer:

Correct Answer: Axillary Nerve

Discussion:

The quadrangular space is lateral to the scapula and is defined by laterally by the humerus, medial by the triceps, rostrally by the teres minor and caudally by the teres major. The axillary nerve along with the circumflex artery exit caudal to the teres minor and rostral to the teres major, providing innervation to the deltoid. The suprascapular nerve originates from the upper trunk and passes across the posterior triangle of the neck providing innervation to the supraspinatus and infraspinatus. The thoracodorsal nerve originates from the posterior cord and provides innervation to the latissimus dorsi. The radial nerve innervates most of the upper extremity extensors and exits below the quadrangular space between the long and lateral heads of the triceps. The long thoracic nerve originates from roots C5, C6, and C7 traversing the chest to provide innervation of the

serratus anterior muscle. Injury to the long thoracic nerve results in scapular winging.

References:

Adult Traumatic Brachial Plexus Injuries. Noland SS, Bishop AT, Spinner RJ, Shin AY. *J Am Acad Orthop Surg*. 2019 Oct 1;27(19):705-716. doi: 10.5435/JAAOS-D-18-00433. PMID: 30707114

Khan IA, Varacallo M. *Anatomy, Shoulder and Upper Limb, Arm Quadrangular Space*. 2020 Jul 31. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. PMID: 30726009.

Question:

Which of the following muscles does the median nerve supply?

Answers:

- A. 4th and 5th lumbricals
- B. Adductor pollicis
- C. Flexor carpi ulnaris
- D. Extensor indicis
- E. Pronator quadratus

Correct Answer:

Correct Answer: Pronator quadratus

Discussion:

The median nerve originates from both the lateral and medial cords of the brachial plexus (C5-T1). The median nerve provides sensory innervation to the anterolateral surface of the hand and provides motor innervation to the following muscles – pronator teres, flexor carpi radialis, palmaris longus, and flexor digitorum superficialis, flexor pollicis longus and flexor digitorum profundus, pronator quadratus, opponens pollicis brevis, and flexor pollicis brevis, 1st and 2nd lumbricals. The ulnar nerve supplies the 4th and 5th lumbricals, flexor carpi ulnaris, and adductor pollicis. The radial nerve provides innervation to the extensor indicis.

References:

Brachial plexus anatomy. Leinberry CF, Wehbé MA. *Hand Clin*. 2004 Feb;20(1):1-5. doi: 10.1016/s0749-0712(03)00088-x. PMID: 15005376

Wertsch JJ, Melvin J. Median nerve anatomy and entrapment syndromes: a review. *Arch Phys Med Rehabil*. 1982 Dec;63(12):623-7. PMID: 6756339.

Question:

The external branch of the superior laryngeal nerve innervates which of the following structures?

Answers:

- A. Sternothyroid muscles

- B. Cricothyroid muscles
- C. Thyrohyoid muscles
- D. Stylohyoid muscle
- E. Omohyoid muscle

Correct Answer:

Correct Answer: Cricothyroid muscles

Discussion:

The superior laryngeal nerve is a branch of the vagal nerve providing motor innervation to the cricothyroid muscle through the external laryngeal nerve and sensory innervation to the laryngeal mucosa. The cricothyroid muscle functions to tense the vocal cords. The omohyoid muscle is innervated by the ansa cervicalis. The thyrohyoid muscle is nerved by C1 and functions to elevate the larynx and depress the hyoid. The stylohyoid muscle provides motor function to the hyoid bone and is innervated by the facial nerve. The sternothyroid muscle is innervated by the ansa cervicalis and also provides motor function to the hyoid bone.

References:

Recurrent laryngeal nerve paralysis: anatomy and etiology. Myssiorek D. *Otolaryngol Clin North Am.* 2004 Feb;37(1):25-44, v. doi: 10.1016/S0030-6665(03)00172-5. PMID: 15062685

Gokaslan ZL, Bydon M, De la Garza-Ramos R, Smith ZA, Hsu WK, Qureshi SA, Cho SK, Baird EO, Mroz TE, Fehlings M, Arnold PM, Riew KD. Recurrent Laryngeal Nerve Palsy After Cervical Spine Surgery: A Multicenter AOSpine Clinical Research Network Study. *Global Spine J.* 2017 Apr;7(1 Suppl):53S-57S. doi: 10.1177/2192568216687547. Epub 2017 Apr 1. PMID: 28451492; PMCID: PMC5400187.

Question:

Which of the following muscles is innervated by the inferior gluteal nerve?

Answers:

- A. Gluteus Maximus
- B. Obturator internus
- C. Gluteus Medius
- D. Piriformis
- E. Gluteus Minimus

Correct Answer:

Correct Answer: Gluteus Maximus

Discussion:

The Gluteus Maximus receives primary innervation from the inferior gluteal nerve. The nerve originates from L5, S1, and S2. The nerve traverses the greater sciatic foramen and runs deep to the piriformis muscle. Injury to the inferior gluteal nerve results in weakness in hip extension. Injury does not impact standing and patients are able to compensate with walking but typically have

difficulty with standing from sitting and running. Injury occurs most frequently with posterior approach hip replacement.

References:

The diagnostic anatomy of the radial nerve. In: Russell SM, ed. Examination of Peripheral Nerve Injuries: An Anatomical Approach. New York, NY: Thieme; 2006:46.

Anatomy, Abdomen and Pelvis, Inferior GlutealNerve

Justin Merryman, Edinen Asuka 1, Matthew Varacallo 2

In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan.

2020 Sep 8.

<https://pubmed.ncbi.nlm.nih.gov/30422479/>

Question:

Which of the following is the most appropriate time for repair of a clean, sharp nerve laceration after injury?

Answers:

- A. 3-6 months
- B. 1-3 days
- C. 1-3 months
- D. 1-3 weeks
- E. 6-12 months

Correct Answer:

Correct Answer: 1-3 days

Discussion:

In general sharp lacerations should be taken to the OR for exploration within 72 hours. Exploration may demonstrate a blunt injury or an injury that is not amendable to immediate repair as the extent of injury may be unclear. Injuries in continuity should be followed clinically and with electrodiagnostic studies to delineate extent of injury and patterns of recovery. The most salient factors that influence recovery are: severity, time, mechanism of injury, proximity to distal targets and patient age. The majority of nerve injuries (>70%) leave the nerve in gross continuity.

References:

Peripheral Nerve Trauma: Mechanisms of Injury and Recovery Ron M. G. Menorca, Theron S. Fussell, John C. Elfar Hand Clin. 2013 Aug; 29(3): 317-330. doi: 10.1016/j.hcl.2013.04.002 PMID: 23895713

Griffin JW, Hogan MV, Chhabra AB, Deal DN. Peripheral nerve repair and reconstruction. J Bone Joint Surg Am. 2013 Dec 4;95(23):2144-51. doi: 10.2106/JBJS.L.00704. PMID: 24306702.

Question:

A 73-year-old man with lung cancer has had a claw hand deformity on the left for the past week. Physical examination shows Horner's syndrome and wasting of the intrinsic muscles of the left hand. There is loss of sensation over the ulnar aspect of the hand and forearm. Which of the following is the most likely site of the lesion?

Answers:

- A. Middle trunk
- B. Anterior division
- C. Posterior division
- D. Upper trunk
- E. Lower trunk

Correct Answer:

Correct Answer:

Lower trunk

Discussion:

Pancoast tumors occur at the apex of the lung, typically representing a form of non-small cell lung carcinoma. As the lesion grows it can cause compression of the surrounding structures of the chest wall including the superior cervical ganglion causing a horner's syndrome and the lower trunk of the brachial plexus causing hand weakness and ulnar distribution sensory loss.

References:

Management of Pancoast tumours. Rusch VW. *Lancet Oncol.* 2006 Dec;7(12):997-1005. doi: 10.1016/S1470-2045(06)70974-3. PMID: 17138221

Akboru IM, Solmaz I, Secer HI, Izci Y, Daneyemez M. The surgical anatomy of the brachial plexus. *Turk Neurosurg.* 2010 Apr;20(2):142-50. doi: 10.5137/1019-5149.JTN.2368-09.2. PMID: 20401841.

Question:

The ulnar nerve courses around to the medial epicondyle to enter which of the following muscles?

Answers:

- A. Extensor carpi ulnaris
- B. Flexor carpi ulnaris
- C. Pronator teres
- D. Flexor digitorum profundus
- E. Pronator quadratus

Correct Answer:

Correct Answer: Flexor carpi ulnaris

Discussion:

The ulnar nerve originates from C8 and T1 nerve roots and enters the anterior flexor compartment of the forearm between the two heads of the flexor carpi ulnaris as it wraps around the medial epicondyle to exit the cubital tunnel. The leading edge of Osborne's fascia between the oblique fibers of the flexor carpi ulnaris represents the most common compression site of the ulnar nerve.

References:

Ulnar nerve entrapment at the elbow. A surgical series and a systematic review of the literature. Lauretti L, D'Alessandris QG, De Simone C, Legninda Sop FY, Remore LM, Izzo A, Fernandez E.J Clin Neurosci. 2017 Dec;46:99-108. doi: 10.1016/j.jocn.2017.08.012. Epub 2017 Sep 8. PMID: 28890032

Huang JH, Samadani U, Zager EL. Ulnar nerve entrapment neuropathy at the elbow: simple decompression. Neurosurgery. 2004 Nov;55(5):1150-3. doi: 10.1227/01.neu.0000140841.28007.f2. PMID: 15509321.

Question:

The posterior interosseous nerve is a branch of which of the following nerves?

Answers:

- A. Axillary Nerve
- B. Radial Nerve
- C. Median Nerve
- D. Ulnar Nerve
- E. Thoracodorsal Nerve

Correct Answer:

Correct Answer: Radial Nerve

Discussion:

The posterior interosseous nerve is a distal branch of the radial nerve. The posterior interosseous nerve provides innervation to the following muscles: extensor carpi radialis brevis, extensor digitorum, extensor digiti minimi, extensor carpi ulnaris, supinator, abductor pollicis longus, extensor pollicis brevis, extensor pollicis longus, extensor indicis. The median and ulnar nerves provide innervation the flexors of the forearm and hand. The axillary nerve innervates the deltoid and teres minor. The thoracodorsal nerve innervates the latissimus dorsi.

References:

Brachial plexus anatomy. Leinberry CF, Wehbé MA. Hand Clin. 2004 Feb;20(1):1-5. doi: 10.1016/s0749-0712(03)00088-x. PMID: 15005376

Wheeler R, DeCastro A. Posterior Interosseous Nerve Syndrome. 2020 Oct 27. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. PMID: 31082090.

Question:

The deep peroneal nerve innervates which of the following muscles?

Answers:

- A. Tibialis anterior, extensor hallucis longus, peronus longus, peroneus brevis
- B. Tibialis anterior, extensor hallucis longus
- C. Peronus longus, peroneus brevis peronus tertius
- D. Tibialis anterior, extensor hallucis longus, peroneus tertius, extensor digitorum longus
- E. Peronus longus, peroneus tertius, extensor digitorum longus

Correct Answer:

Correct Answer: Tibialis anterior, extensor hallucis longus, peroneus tertius, extensor digitorum longus

Discussion:

The common peroneal nerve is distal branch of the sciatic nerve that typically has contributions from L4, L5, S1, and S2. It originates from the sciatic nerve in the popliteal fossa. After it crosses the fibular head it is further divided into the superior, inferior and recurrent genicular nerves, the sural nerve and the deep and superficial peroneal nerves. The deep peroneal nerve supplies the extensor muscles in the anterior leg including the tibialis anterior, extensor hallucis longus, peroneus tertius and the extensor digitorum longus. Injury or compression typically results in foot drop. Surgical release of the deep peroneal nerve typically involves decompression of the fascial edge or ligament of the extensor digitorum brevis.

References:

Common Entrapment Neuropathies. Malek E, Salameh JS. *Semin Neurol.* 2019 Oct;39(5):549-559. doi: 10.1055/s-0039-1693004. Epub 2019 Oct 22. PMID: 31639838

<https://pubmed.ncbi.nlm.nih.gov/?term=%22deep+peroneal+nerve%22&filter=pubt.review&sort=pubdate>

Question:

Which of the following muscles is innervated by the anterior interosseous nerve?

Answers:

- A. Flexor pollicis longus, flexor digitorum profundus, pronator quadratus
- B. Palmaris longus, pronator quadratus
- C. Flexor carpi radialis, flexor digitorum profundus, palmaris longus
- D. Flexor pollicis longus, flexor carpi radialis
- E. Pronator quadratus, palmaris longus, flexor pollicis longus

Correct Answer:

Correct Answer: Flexor pollicis longus, flexor digitorum profundus, pronator quadratus

Discussion:

The anterior interosseous nerve is a distal branch of the median nerve that originates at the level of the anterior forearm. It originates from the nerve roots C8 and T1. It innervates the flexor pollicis longus, flexor digitorum profundus, and the pronator quadratus. Compression at the level of the forearm or Parsonage-Turner syndrome are the most common pathologies producing varying degrees of weakness but without sensory deficit.

References:

Innervation of the Flexor Digitorum Profundus: A Systematic Review. Hwang K, Bang SJ, Chung SH. *Plast Surg (Oakv)*. 2018 May;26(2):120-125. doi: 10.1177/2292550317740692. Epub 2017 Nov 22. PMID: 29845050

<https://pubmed.ncbi.nlm.nih.gov/26261744/>

Question:

The right obturator nerve is inadvertently sectioned sharply during a gynecologic procedure. Which of the following is the most appropriate management of this injury?

Answers:

- A. Tag the nerve ends and delayed repair in 3 weeks
- B. Tag the nerve ends and delayed repair in 3-6 months
- C. Tag the nerve ends and delayed repair in 1-3 months
- D. Immediate end to end repair with intervening 3-5 cm cadaveric allograft
- E. Immediate end to end repair

Correct Answer:

Correct Answer: Immediate end to end repair

Discussion:

The obturator nerve originates from L2, L3, and L4, providing sensory innervation to the medial thigh and motor innervation to the adductor longus, adductor brevis, adductor magnus, external obturator, and variably to the pectineus. Sharp transection of a nerve that is recognized at the time of surgery should be acutely repaired. Typically a sharp transection can be repaired in an end to end fashion. Tagging the distal and proximal nerve endings can be performed for crush and segmental injuries where the true extent of injury may not be apparent at the time of surgery and these are typically repaired in a delayed fashion within 3 weeks. Cadaveric nerve allograft can be used but does require immunosuppression similar to solid organ transplants. Although allograft is an option it would be reserved for cases where insufficient donor autograft is available.

References:

Dahlin LB. The role of timing in nerve reconstruction. *Int Rev Neurobiol*. 2013;109:151-64.

Griffin JW, Hogan MV, Chhabra AB, Deal DN. Peripheral nerve repair and reconstruction. *J Bone Joint Surg Am*. 2013 Dec 4;95(23):2144-51. doi: 10.2106/JBJS.L.00704. PMID: 24306702.

Question:

A 40-year-old woman comes to the emergency department because of shortness of breath after being involved in a high-speed motor vehicle collision. She says that she was not wearing her seat belt and that she jammed her chest and left armpit into the steering wheel upon impact. She has no neck pain. On examination, she is unable to contract the left biceps or supinate the left hand, and she has decreased sensation over the left lateral forearm. Which of the following peripheral nerves is most likely injured?

Answers:

- A. Ulnar nerve
- B. Median nerve
- C. Axillary nerve
- D. Musculocutaneous nerve
- E. Radial nerve

Correct Answer:

Correct Answer: Musculocutaneous nerve

Discussion:

Peripheral nerve injuries occur in 1-3% of all trauma patients. Although isolated injury to the musculocutaneous nerve is uncommon it results in weakness in elbow flexion (biceps and brachialis branch) and sensory loss in the distribution of the lateral antebrachial cutaneous nerve. Injury to the axillary nerve can occur with traumatic shoulder dislocations causing weakness with shoulder abduction and external rotation. The median and ulnar nerve provide innervation to the flexors of the forearm and hand, while the radial nerve provides innervation to the extensors. The radial nerve can be injured in isolation, most commonly with a proximal humerus fracture.

References:

Adult brachial plexus injury: evaluation and management. Limthongthang R, Bachoura A, Songcharoen P, Osterman AL. *Orthop Clin North Am.* 2013 Oct;44(4):591-603. doi: 10.1016/j.ocl.2013.06.011. Epub 2013 Sep 6. PMID: 24095074

Yang ZX, Pho RW, Kour AK, Pereira BP. The musculocutaneous nerve and its branches to the biceps and brachialis muscles. *J Hand Surg Am.* 1995 Jul;20(4):671-5. doi: 10.1016/S0363-5023(05)80289-8. PMID: 7594300.