

## Sports-Related Nerve Injuries: Review Questions

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### QUESTIONS

Choose the single best answer for each question.

- A 13-year-old girl falls during a cross-country race, striking her left arm on a rock. In the emergency department (ED), the patient holds her arm tightly to her chest, flexed at about 90 degrees. An obvious deformity of her elbow and forearm is evident on physical examination. Radiographic studies reveal a proximal ulnar fracture and dislocation of the radial head. This patient would most likely experience weakness or paralysis when performing which of the following movements?

  - Flexion of wrist and fingers
  - Abduction and adduction of fingers
  - Opposition of thumb to the little finger
  - Extension of the thumb
  - Extension of the forearm
- A 35-year-old man presents to the ED with constant, excruciating pain in his left leg after completing a marathon. He denies any specific trauma, although he acknowledges that the race was the longest distance he has ever run. The physical examination is remarkable for nonfocal left leg tenderness, swelling, and loss of light touch sensation on the plantar aspect of the left foot; however, the patient still rates his pain at 10 of 10. Results of radiographic studies and bone scan are normal. Which of the following tests is most likely to provide a definitive diagnosis?

  - Cardiac stress testing
  - Computed tomographic scan of the leg
  - Doppler sonogram
  - Electromyography and nerve conduction study
  - Intracompartmental pressure measurement with slit catheter
- An 11-year-old little league pitcher presents to the ED with a chief complaint of pain and numbness in the medial aspect of his elbow on his throwing arm. He also complains of a "locking sensation" in his elbow when pitching. Physical examination reveals mild crepitus, a positive Tinel's sign in the cubital tunnel, and decreased sensation in the fourth and fifth digits. Radiographic evaluation reveals an olecranon osteophyte formation and a large posteromedial loose body. Which of the following statements regarding this patient's condition is correct?

  - There is no role for surgical excision of the olecranon osteophyte or loose body.
  - The valgus extension overload (VEO) test is a helpful diagnostic aid.
  - If left untreated, this patient will develop wrist extensor weakness.
  - This patient's elbow pain will be worst during the follow-through phase of a pitch.
  - Medial ligamentous laxity decreases olecranon impingement within the olecranon fossa.
- A 24-year-old soccer player presents with a chief complaint of shoulder weakness and pain 1 week after sustaining an apparent anterior shoulder dislocation. He fell on his outstretched right arm during a match; the dislocation was then reduced on the field by a teammate. On physical examination,

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the patient's left shoulder appears larger than the right, and he has decreased light touch and pin-prick sensation over the upper lateral right arm.

Which nerve is most likely affected?

- (A) Axillary nerve
- (B) Long thoracic nerve
- (C) Musculocutaneous nerve
- (D) Spinal accessory nerve
- (E) Suprascapular nerve

#### ANSWERS AND EXPLANATIONS

1. **(D) Extension of the thumb.** The combination of proximal or middle ulnar fracture and concomitant radial head dislocation is known as the Monteggia fracture-dislocation. The deep branch of the radial nerve (the posterior interosseous nerve [PIN]) is often injured due to its intimate association with the radial head and neck. The PIN provides innervation to the muscles of the posterior compartment of the arm, including the extensor pollicis longus, extensor pollicis brevis, and extensor digitorum. Therefore, a PIN lesion manifests as weakness or paralysis in thumb and finger extension.<sup>1</sup> Forearm extension is controlled by the radial nerve proximal to the elbow and therefore provides innervation to the forearm extensors and would not be affected by a radial head dislocation. Flexion of the wrist and fingers is controlled by the median and ulnar nerves, abduction and adduction of the fingers are controlled by the ulnar nerve, and the median nerve controls thumb opposition.<sup>2</sup>
2. **(E) Intracompartmental pressure measurement with slit catheter.** This patient's presentation and clinical findings are consistent with acute exertional compartment syndrome (ECS) of the leg. The hallmark presentation for ECS is pain out of proportion to physical examination findings. ECS arises when increased pressure develops within a myofascial compartment, which compromises circulation and function of the enclosed tissues. Although cardiac stress testing, computed tomographic scan of the leg, Doppler sonogram, and electromyography and nerve conduction studies may be somewhat useful to rule out bone, muscular, or vascular etiologies of the leg pain, an intracompartmental pressure measurement with a slit catheter revealing a pressure greater than 20 mm Hg is considered diagnostic of compartment syndrome. This patient's sensory deficit (plantar foot paresthesia) points to tibial nerve compression and corresponding deep posterior compartment involvement.<sup>3</sup>

3. **(B) The VEO test is a helpful diagnostic aid.** This patient is experiencing posteromedial olecranon osteophytosis (also known as VEO syndrome), a common cause of elbow pain in young adolescent baseball players. Repetitive throwing leads to impingement of the tip of the olecranon in the olecranon fossa during the acceleration phase of a pitch, the stage when valgus stress on the elbow is greatest. Olecranon impingement is often exacerbated in young athletes because of the intrinsic ligament and joint laxity seen during adolescence. Impingement can lead to the formation of an olecranon osteophyte that can compress the ulnar nerve, which can cause pain and loss of sensation in the ulnar nerve territory. It should not affect wrist extension strength, which is controlled by the radial nerve. The VEO test can help to make a definitive diagnosis: valgus stress is maintained while the elbow is passively flexed, eliciting pain along the posteromedial aspect of the olecranon. In cases in which the patient experiences mechanical locking with evidence of a loose body, surgical excision of the loose body and the olecranon osteophyte is warranted and is often curative.<sup>4</sup>
4. **(A) Axillary nerve.** Anterior shoulder dislocations are often associated with injuries of the axillary nerve owing to its intimate association with the shoulder complex. This patient may have experienced further injury to the nerve as a result of an improper on-field reduction. Axillary nerve compression typically presents with wasting and weakness of the deltoid muscle (its site of motor innervation) and loss of sensation over the lateral upper arm ("regimental badge area").<sup>5</sup>

#### REFERENCES

1. Perron AD, Hersh RE, Brady WJ, Keats TE. Orthopedic pitfalls in the ED: Galeazzi and Monteggia fracture-dislocation. *Am J Emerg Med* 2001;19:225–8.
2. Ruddy S, Harris ED, Sledge CB, editors. *Kelley's textbook of rheumatology*. 6th ed. Philadelphia: WB Saunders; 2001.
3. Edwards P, Myerson MS. Exertional compartment syndrome of the leg: steps for expedient return to activity. *Phys Sports Med* 1996;24:4–6.
4. Ahmad CS, ElAttrache NS. Valgus extension overload syndrome and stress injury of the olecranon. *Clin Sports Med* 2004;23:665–76.
5. Mendoza FX, Main WK. Peripheral nerve injuries of the shoulder in the athlete [published erratum appears in *Clin Sports Med* 1990;9:ix. Main WK]. *Clin Sports Med* 1990;9:331–42.