1. You are treating a patient after flexor digitorum profundus repair to the ring finger. You note that he has a significant reduction of finger flexion force in the digits adjacent to the ring finger. You also recognize a flexion contracture of the ring finger. What might this patient be experiencing?

A. Lumbrical-plus phenomenon
B. Quadrigia phenomenon
C. Linburg's sign
D. Egawa's sign

When a quadrigia phenomenon occurs, the patient exhibits a flexion contracture of the involved digit and a decreased amount of flexion force in the digits next to the injured finger. The quadrigia effect can occur if the flexor digitorum profundus is advanced more than 1 cm during repair, thus resulting in limited proximal excursion of the remaining flexor digitorum profundus tendons. To prevent a quadrigia effect, one should use advancement only for the flexor pollicis longus.

Answer: B

Hunter, Schneider, Mackin, pp. 423, 428, 595
Culp, Taras in Mackin, Callahan, Skirven, et al, pp. 421-426
Ejeskar, p. 63

2. Which of the following statements about Guyon's canal is false?

A. Contains the median nerve
B. Contains the ulnar nerve
C. Contains the ulnar artery
D. Borders the hook of the hamate and the pisiform

The ulnar nerve and artery are contained in Guyon's triangular canal. It is immediately ulnar to the carpal tunnel and may be a site of ulnar nerve entrapment. The borders of this canal are the hook of the hamate and the pisiform. The median nerve is in the carpal tunnel, not Guyon's canal.

Answer: A

Leclercq, pp. 506-507
Matloub & Yousef, pp. 201-214
Refer to Fig. 1-1

![Fig. 1-1](image)

**Fig. 1-1** Boundaries and contents of Guyon's canal. C, Capitate; H, hamate; L, lunate; P, pisiform; S, scaphoid; T, trapezoid; TCL, transverse carpal ligament; UN, ulnar nerve; UA, ulnar artery; and VCL, carpal ligament. (From Moneim MS: Ulnar nerve compression at the wrist: ulnar tunnel syndrome, Hand Clin 8(2):338, 1992.)

3. Which of the following statements are true of the anatomical “snuffbox”?

A. Lunate forms the floor.
B. Abductor pollicis longus and extensor pollicis brevis tendon define the ulnar border.
C. Extensor pollicis longus tendon forms the radial border.
D. All of the above are true.
E. None of the above is true.

The ulnar nerve and artery are contained in Guyon's triangular canal. It is immediately ulnar to the carpal tunnel and may be a site of ulnar nerve entrapment. The borders of this canal are the hook of the hamate and the pisiform. The median nerve is in the carpal tunnel, not Guyon's canal.
The anatomical snuffbox is formed by the scaphoid at the base; the abductor pollicis longus and extensor pollicis brevis define the radial border; and the extensor pollicis longus lines the ulnar border.

Answer: E
Mehta
Refer to Fig. 1-2

4. Protraction—or hunching—of the shoulders is completed by which of the following muscles (pick the most complete answer)?

A. Pectoralis major and serratus anterior
B. Pectoralis major, serratus anterior, and pectoralis minor
C. Pectoralis major, serratus anterior, and anterior deltoid
D. Pectoralis major, serratus anterior, anterior deltoid, and pectoralis minor

The large, strong serratus anterior as well as the pectoralis major and minor place the humerus in the “hunched shoulder” or protracted position.

Answer: B
Bogumill, pp. 1637-1639
Refer to Fig. 1-3

Clinical Gem:
If an individual works all day on a computer or is a computer enthusiast, his or her shoulder protractors are typically shortened and the retractors stretched. Stretching exercises for the protractors, strengthening exercises for the retractors, and postural reeducation are essential. Ergonomic principles for a computer workstation should be addressed.
5. Which structures run through the carpal tunnel? (Pick the most complete answer.)

A. Median nerve, flexor digitorum profundus, flexor digitorum superficialis
B. Median nerve, palmaris longus, flexor digitorum profundus, flexor digitorum superficialis
C. Median nerve, flexor pollicis longus, flexor digitorum profundus, flexor digitorum superficialis
D. Median nerve, flexor pollicis longus, palmaris longus, flexor digitorum profundus, flexor digitorum superficialis

The carpal tunnel contains ten structures: the median nerve, four flexor digitorum profundus tendons, four flexor digitorum superficialis tendons, and the flexor pollicis longus tendon. The carpal tunnel lies deep to the palmaris longus. Its borders are the pisiform, the scaphoid tubercle, the hook of the hamate, and the trapezium tubercle.

Answer: C
Hoppenfeld, p. 83
Refer to Fig. 1-4

6. What is the anatomic interconnection between the flexor pollicis longus and the index finger flexor digitorum profundus called?

A. Linburg's sign
B. Reiter's syndrome
C. Egawa's sign
D. None of the above

An anatomic interconnection between the flexor pollicis longus and the index flexor digitorum profundus is present in approximately 31% of the population. The connection may be through an anomalous tendon, musculotendinous slip, or an adherence to the tenosynovium. This anatomic variation is called Linburg's sign. Linburg's syndrome can occur when this interconnection leads to pain and aggravation with activity. The discomfort is located over the radiopalmar aspect of the distal forearm and thumb.

Answer: A
Cooney, Linscheid, Dobyns, p. 1194
Refer to Fig. 1-5

Fig. 1-4

Fig. 1-5 ■ Note the flexion of the index finger when active interphalangeal (IP) thumb flexion is performed.

Clinical Gem:
To assess for Linburg's sign, have the patient actively flex the thumb interphalangeal joint. Look for involuntary motion at the index finger distal interphalangeal joint.
7. What condition is often present with Lindburg's syndrome?

A. Anterior interosseous syndrome
B. Fracture of the radius
C. Trigger finger
D. Carpal tunnel syndrome

Carpal tunnel syndrome is often present with Lindburg's syndrome. Lindburg's syndrome involves tenosynovitis in the flexor pollicis longus and usually includes the flexor digitorum of the index (because of an associated anomalous interconnection). Patients complain of distal (radiopalmar) forearm and hand pain that is aggravated when distal interphalangeal (DIP) flexion of the index is blocked because the thumb is actively flexed into the palm.

Answer: D
Stern, pp. 467-476

8. What are the primary pathological structures that produce proximal interphalangeal joint flexion contractures?

A. Check rein ligaments
B. Collateral ligaments of the proximal interphalangeal joint
C. Lateral bands
D. Oblique retinacular ligaments

Contractures of the proximal interphalangeal joints occur after an unspecified period of time in a negative hand position (intrinsic minus). Thin fibers called swallowtails are extensions of the volar plate at the proximal interphalangeal joint. When these swallowtails become hypertrophied and shortened, they are termed check rein ligaments. Check rein ligaments can develop rapidly after edema occurs or progressively, as in Dupuytren's contracture.

Answer: A
Green, p. 550
Refer to Fig. 1-6

9. Match the following dorsal wrist compartments with the tendon(s) that reside in each compartment.

<table>
<thead>
<tr>
<th>Compartment</th>
<th>Tendon(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. First dorsal wrist compartment</td>
<td>A. Abductor pollicis longus (APL), extensor pollicis brevis (EPB)</td>
</tr>
<tr>
<td>2. Second dorsal wrist compartment</td>
<td>B. Extensor digiti minimi (EDM)</td>
</tr>
<tr>
<td>3. Third dorsal wrist compartment</td>
<td>C. Extensor carpi ulnaris (ECU)</td>
</tr>
<tr>
<td>4. Fourth dorsal wrist compartment</td>
<td>D. Extensor pollicis longus (EPL)</td>
</tr>
<tr>
<td>5. Fifth dorsal wrist compartment</td>
<td>E. Extensor digitorum (ED); extensor indicis proprius (EIP)</td>
</tr>
<tr>
<td>6. Sixth dorsal wrist compartment</td>
<td>F. Extensor carpi radialis longus (ECRL); extensor carpi radialis brevis (ECRB)</td>
</tr>
</tbody>
</table>

Answers: 1, A; 2, F; 3, D; 4, E; 5, B; 6, C
Miller, p. 544
Refer to Fig. 1-7

CLINICAL GEM:
To remember the dorsal compartments, one can recall the numbers 22, 12, and 11. These numbers correlate with the numbers of tendons in each of the six dorsal compartments.
10. True or false: The extensor carpi radialis brevis is the strongest wrist extensor.

True

The ECRB originates from the lateral epicondyle of the humerus and inserts onto the base of the third metacarpal. The ECRB has the longest extension moment arm and the largest cross-section and is the strongest and most efficient wrist extensor. The ECRL, in contrast, has the longest muscle fibers and the largest mass and therefore has a greater capacity for sustained work. The ECRB becomes a more efficient wrist extensor when the forearm is supinated.

Answer: True

Hunter, Mackin, Callahan, p. 523
Rosenthal in Mackin, Callahan, Skirven, et al, p. 502

11. Lateral epicondylitis is a common diagnosis in work-related injuries. Which muscle is primarily affected?

A. Extensor carpi radialis longus
B. Extensor carpi radialis brevis
C. Extensor digitorum
D. Extensor carpi ulnaris
E. Brachioradialis

The extensor carpi radialis brevis is the most commonly affected muscle in lateral epicondylitis. It causes pain with passive wrist flexion and active (and resisted) wrist deviation. The ECU becomes a more efficient wrist extensor when the forearm is supinated.

Answer: True
extension. The most tender spot is located 1 to 2 cm distal to the lateral epicondyle.

Answer: B
De Smet, Fabry, pp. 229-231
Nirschl, pp. 537-552

The A1 pulley is the structure that is surgically released when trigger finger is the culprit. Although patients may complain about pain at the PIP joint level, the pathology is at the MP level at the A1 pulley. The A1 pulley can become thickened and narrow from chronic inflammation and will trap the flexor tendon.

Answer: A
Hunter, Mackin, Callahan, pp. 1007-1012
Lee, Nassir-Sharif, Zelouf in Mackin, Callahan, Skirven, et al, p. 939

Clinical Gem:
Grip testing with the elbow flexed to 90 degrees is less painful for the patient with lateral epicondylitis versus when the grip test is performed with the elbow straight and locked. Most patients with lateral epicondylitis will benefit from education in avoiding provocative motions, such as a forceful grasp and/or lifting with elbow extended and forearm pronated. Refer to Fig. 1-8.

12. Which pulley is most commonly affected in trigger finger?

A. A1 pulley
B. A2 pulley
C. A3 pulley
D. A4 pulley
E. A5 pulley

Clinical Gem:
During trigger finger physical examination, run your finger along the flexor tendons in the palm. Often a nodule is palpable on the flexor tendon just proximal to the MCP joint.

13. Which of the following does not serve as an attachment site for the transverse carpal ligament?

A. Scaphoid
B. Trapezium
C. Hamate
D. Triquetrum
E. Pisiform
The transverse carpal ligament (TCL) attaches to the scaphoid tuberosity, the crest of the trapezium, the pisiform, and the hook of the hamate. The TCL forms the roof of the carpal canal and ranges in thickness from 1 to 3.5 mm. The TCL prevents the long flexors of the fingers from bowstringing when the wrist flexes and serves as an attachment site for thenar and hypothenar muscles.

Answer: D
Hunter, Mackin, Callahan, pp. 905-906

14. What is the best treatment for an acute compartment syndrome?

A. Application of ice until swelling subsides
B. Active range of motion (AROM) exercises of the affected musculature, followed first by soft tissue massage and then by application of ice pack
C. Immediate fasciotomy of all compartments involved
D. All of the above

Acute compartment syndrome may be caused by crush injury, thermal or electrical burns, snakebite, or fracture. Symptoms include pain, paresthesias, paralysis, and pulselessness. The most telling sign is pain that is out of proportion to a normal pain response and that is not alleviated by rest. Because increasing pressure in the compartment can result in necrosis—which leads to fibrosis of the muscles and other soft tissues—an immediate fasciotomy must be done after the diagnosis is reached.

Answer: C
Naidu, Heppenstall, pp. 13-27
Gellman, Keyur, pp. 385-389

15. True or false: A Martin-Gruber anastomosis is present in 35% to 45% of the population.

This anomaly is present in 15% to 20% of the population. The Martin-Gruber anastomosis is between the median nerve and the ulnar nerve at the forearm level. The anastomosis usually consists of median-nerve innervated motor fibers that supply the typically ulnar-innervated intrinsics. Ulnar sensory fibers also may be innervated by the median nerve when this anastomosis exists.

Answer: False
Kimura, p. 418
Tubiana, Thonne, Mackin, p. 277
Refer to Fig. 1-9

16. Match each muscle to the correct description:

Muscle
1. Abductor pollicis brevis
2. Extensor carpi radialis brevis
3. Extensor carpi ulnaris
4. Supinator
5. Extensor pollicis longus
6. Adductor pollicis
7. First volar interosseous
8. First dorsal interosseous

Description
A. Strong finger abductor that inserts into the base of the proximal phalanx of the index finger
B. Innervated by the median nerve and originates from the transverse carpal ligament
C. Innervated by the ulnar nerve and inserted into the ulnar side of the proximal phalanx of the thumb and the extensor expansion of the thumb
D. Inserts into the base of the third metacarpal
E. Innervated by the posterior interosseous nerve (PIN) and inserts into the base of the fifth metacarpal
F. Originates from the lateral epicondyle of the humerus and the adjacent portion of the ulna and inserts into the upper third of the radius
G. Innervated by the posterior interosseous nerve and inserts into the first distal phalanx
H. Originates from the length of the second metacarpal and adducts the index finger

Answers: 1, B; 2, D; 3, E; 4, F; 5, G; 6, C; 7, H; 8, A
Malick, Kasch, pp. 57-58, 66

Clinical Gem:
The APB is the strongest muscle of anteposition (opposition). In 1867, D uchenne called the APB muscle the opposing phalangeal muscle of the thumb because of its action on the tip.
17. The elbow's main stabilizer to valgus strain is which of the following?

A. Medial epicondyle  
B. Medial collateral ligament  
C. Lateral epicondyle  
D. Lateral collateral ligament

The medial (ulnar) collateral ligament (UCL) is the main stabilizer of the elbow joint and prevents valgus strain. The UCL originates slightly anterior and inferior to the medial epicondyle. It fans out to its attachment along the greater sigmoid fossa. It comprises anterior, posterior, and transverse bands. Damage to the UCL usually necessitates surgery.

Answer: B  
Morrey, pp. 549-551  
Refer to Fig. 1-10

18. With paralysis of the interosseous muscles, the long finger extensors are unopposed. They hyperextend the metacarpophalangeal (MCP) joints during finger extension. However, stabilization and prevention of hyperextension of the MCP joint (placing and holding the MCP in slight flexion) during extension can transfer the force from the long extensors to the PIP and DIP joints, thus resulting in extension. Which test was just described?

A. Tinel's  
B. Bouvier  
C. Adson's  
D. Finochietto-Bunnell

Bouvier is the test described and is used to determine whether the PIP joint capsule and extensor mechanism are working normally. In cases of claw hand deformity (interosseous muscle palsy), if the MCP joints are stabilized and prevented from going into hyperextension, the intrinsic muscle force is transferred distally to the PIP and DIP joints, thus aiding in reestablishing PIP and DIP extension.
Fig. 1-10  ■  A, Lateral view of the bony and ligamentous anatomy of the elbow joint. B, Left, Laxity of the radial collateral ligament (varus instability of the elbow) is examined with the humerus in full internal rotation while varus stress is applied to the joint. Right, Laxity of the medial collateral ligament (valgus instability of the elbow) is evaluated with the humerus in full external rotation as valgus stress is applied to the joint. In both instances, rotation helps stabilize the humerus, allowing ligament laxity to be more easily appreciated. (A, From Mackin EJ, Callahan AD, Skirven TM, et al: Rehabilitation of the hand and upper extremity, ed 5, vol 1, St Louis, 2002, Mosby; B, from Morrey BF: The elbow and its disorders, ed 2, Philadelphia, 1994, WB Saunders.)
**Fig. 1-11**

**CLINICAL GEM:**
When splinting, remember this principle to prevent claw hand deformity following paralysis of the interosseous muscles.

**Fig. 1-12**

19. **True or false:** The most important pulleys in the flexor tendon system are A3 and A5.

Pulleys ensure biomechanical efficiency of the flexor tendons. Their role is to prevent bowstringing of the tendons and to allow the flexors to work efficiently. Each finger has five annular pulleys and three cruciate pulleys. A2 and A4 are the most important pulleys in the flexor tendon system.

**Answer:** False

**Malick, p. 43**
Refer to Fig. 1-12

20. **Wallbangers' disease** refers to persistent hard edema over the dorsum of the hand. The inexplicable edema usually occurs after a minor hand injury. This is more typically known by which of the following terms?
A. SHAFT syndrome
B. Munchausen syndrome
C. Clenched-fist syndrome
D. Secretan’s syndrome

Secretan’s syndrome (Wallbanger’s disease) is a psychological condition that results in self-infliction of harm and exacerbation of symptoms to prolong the illness/disorder.

Answer: D
Kasdan, pp. 57-60

**Clinical Gem:** Remember the S’s: self-inflicted/Secretan’s syndrome.

21. What is the major arterial supply to the forearm and hand?

A. Radial artery
B. Brachial artery
C. Median artery
D. Interosseous artery

The brachial artery continues from the axillary artery and travels distally along the medial arm. The median nerve is nearby. At the antecubital fossa, the brachial artery dives below the lacertus fibrosis and splits into the radial and ulnar arteries. The brachial artery is the major inflow vessel to the forearm and hand.

Answer: B
Spinner, p. 203
Refer to Fig. 1-13

22. How long do blood vessels require protection after surgical repair?

A. 1 to 5 days
B. 7 to 14 days
C. 14 to 21 days
D. 21 to 28 days

Blood vessels require 1 to 2 weeks of protection. This is generally provided by the immobilization needed to protect other structures that are repaired.

Answer: B
Hunter, Mackin, Callahan, p. 1059

23. What is the combined function of Cleland’s and Grayson’s ligaments?

A. Prevents Dupuytren’s contracture
B. Stabilizes the metacarpophalangeal joint
C. Stabilizes the basal joint
D. Prevents rotary movements of the skin around the fingers

Fig. 1-13 From Mackin EJ, Callahan AD, Skirven TM, et al: Rehabilitation of the hand and upper extremity, ed 5, vol 1, St Louis, 2002, Mosby.
Grayson's ligament originates from the volar aspect of the flexor tendon sheath, runs volar to the neurovascular bundle, and inserts into the skin. Cleland's ligament passes dorsally to the neurovascular bundle and inserts into the skin. According to Hoppenfeld, both Grayson's and Cleland's ligaments prevent rotary movement of the skin around the fingers, thus allowing the ability to grasp objects. Grayson's ligament may contribute to a PIP joint flexion contracture in Dupuytren's disease.

Answer: D
Hoppenfeld, p. 65
Green, pp. 564-565
Refer to Fig. 1-14

C l i n i c a l G e m:
Cleland's ligaments are dorsal to the neurovascular bundle. To remember this, recall that “C” for Cleland precedes “D” for dorsal.

24. W h i c h artery provides the primary blood supply to the hand?

A. Radial artery
B. Ulnar artery
C. Persistent median artery
D. All of the above arteries supply the hand equally

The ulnar artery is larger than the radial artery and is usually the primary contributor, supplying 60% of blood to the hand. This artery supplies the superficial palmar arch in most hands, and the radial artery usually supplies the deep palmar arch. The median artery contributes to the superficial palmar arch in approximately 10% of the population. Variation in the superficial arch is greater than in the more consistent deep palmar arch. In general, arterial variations occur in up to a third of the population.

Answer: B
Anderson, Sec. 6-78
Refer to Fig. 1-15
25. Match each muscle with its innervation.

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Adductor pollicis</td>
<td>A. Superficial branch of ulnar nerve</td>
</tr>
<tr>
<td>2. Brachioradialis</td>
<td>B. Deep branch of ulnar nerve</td>
</tr>
<tr>
<td>3. Extensor indicis proprius</td>
<td>C. Posterior interosseous nerve</td>
</tr>
<tr>
<td>4. Palmaris brevis</td>
<td>D. Anterior interosseous nerve</td>
</tr>
<tr>
<td>5. Abductor pollicis brevis</td>
<td>E. Median nerve</td>
</tr>
<tr>
<td>6. Pronator quadratus</td>
<td>F. Radial nerve</td>
</tr>
</tbody>
</table>

Answers: 1, B; 2, F; 3, C; 4, A; 5, E; 6, D

26. Sensory changes, motor changes, and atrophy of the thenar musculature may indicate which of the following?

A. Syringomyelia
B. Peripheral neuritis secondary to diabetes
C. Lead intoxication
D. Charcot-Marie-Tooth disease

Individuals with diabetes may complain of sensory and motor changes and have evidence of thenar muscle atrophy. It may be confused with carpal tunnel compression of the median nerve at the wrist. In fact, carpal tunnel syndrome may coexist in persons with diabetes.

Answer: B

27. Fingernails generally grow at what rate per month?

A. 1 to 2 mm per month
B. 2 to 3 mm per month
C. 3 to 4 mm per month
D. 4 to 5 mm per month

Two to three millimeters per month of nail growth is the expected growth rate. Thus the nail can provide a fairly accurate timetable of systemic insults, whether from toxic substances or disease.

Answer: B

28. During “normal” flexing into a fist, the fingers converge and point toward what structure?

A. Hook of the hamate
B. Tubercle of the trapezium
C. Base of the first metacarpal
D. Scaphoid tubercle

The scaphoid tubercle is the point of finger convergence when a fist is made. When the digits flex into a digitopalmar grip, the more ulnar the digit, the more obliquely it deviates as it comes into the palm. Thus with each digit flexed at the MCP and PIP joints, their axes converge toward the scaphoid bone.

Answer: D

Fig. 1-16 From Weinzeig J: Hand and wrist surgery secrets, Philadelphia, 2000, Hanley & Belfus.
29. Which structure plays a crucial role in the stability of the shoulder?

A. Teres major
B. Glenoid labrum
C. Long head of the biceps
D. Coracoacromial ligament

The stability of the glenohumeral joint is sacrificed because of its great freedom of movement. The humeral head articulates against the glenoid cavity of the scapula. The labrum is important because it gives the glenoid a deeper cavity, thus allowing for increased surface area and stability. The head of the humerus is held in the glenoid cavity by the rotator cuff muscles. The glenoid labrum is a fibrocartilaginous rim that is attached around the margin of the glenoid process.

Answer: B

Refer to Fig. 1-17

30. Which pole of the scaphoid has a generous blood supply?

A. Distal pole
B. Waist
C. Proximal pole
D. All of the above have excellent vascularity.

The scaphoid most often receives its arterial blood supply from the radial artery through ligamentous attachments. The distal pole has a rich blood supply and tends to heal promptly, whereas the proximal pole has poor vascularity and may result in avascular necrosis or nonunion after fracture.

31. Which of the following statements is false with regard to the metacarpophalangeal (MCP) joint collateral ligaments?

A. With the MCP joint extended, the collateral ligaments are loose, and the portion from the metacarpal to the palmar plate is taut.
B. With the MCP joint flexed, the collateral ligaments are tight, and the portion from the metacarpal to the palmar plate is lax.
C. This structure allows for lateral movement during MCP extension and prohibits lateral movement during flexion.
D. This information is not important to consider when one splints the MCP joints.

The information in A through C is vital when splinting the MCP joints. Splinting the MCP joints in extension for prolonged periods tightens the MCP joint collateral ligaments into a shortened position.

Answer: D

Refer to Fig. 1-18

32. Identify the following features (1-7) of the dorsal aspect of the hand in Fig. 1-19.

A. Abductor pollicis longus (APL)
B. J unc turae tendinum
C. Dorsal tubercle of the radius/Lister's tubercle
D. Extensor pollicis longus (EPL)
E. Tendon to extensor carpi radialis longus (ECRL)
F. Extensor retinaculum
G. Extensor digitorum

Fig. 1-18 From Jupiter JB: Flynn's Hand surgery, ed 4, Philadelphia, 1991, Williams & Wilkins.

33.
34. Label the creases (1-8) of the hand and wrist in Fig. 1-20 with the following terms.

A. Thenar crease  
B. Proximal crease of the wrist  
C. Distal crease of the wrist  
D. Proximal flexor crease (proximal palmar crease)  
E. Distal flexor crease (distal palmar crease)  
F. Palmar digital crease  
G. Proximal interphalangeal crease (middle digital crease)  
H. Distal interphalangeal crease (distal digital crease)

Answers: 1, E; 2, A; 3, F; 4, B; 5, H; 6, C; 7, D; 8, G

Chase in Mackin, Callahan, Skirven, et al, p. 64

35. Which nerve and artery pass through the quadrangular space?

A. Musculocutaneous nerve and posterior circumflex artery  
B. Axillary nerve and posterior circumflex artery  
C. Musculocutaneous nerve and anterior circumflex artery  
D. Axillary nerve and anterior circumflex artery

The quadrangular space is bordered by the teres minor superiorly, the teres major inferiorly, the humerus laterally, and the triceps medially. The axillary nerve and posterior circumflex artery pass through this space.

Answer: B

Netter, p. 24
Refer to Fig. 1-21

36. Which artery passes over the floor of the anatomic snuffbox?

A. Radial artery  
B. Ulnar artery  
C. Median artery  
D. Anterior interosseus artery

The anatomic snuffbox is a concave space made by the convergence of the extensor pollicis longus tendon with the extensor pollicis brevis and the abductor pollicis longus tendons. On the floor, the radial artery passes toward the back of the hand to the dorsal carpal branch.

Answer: B

Hunter, M, Callahan, p. 24
Refer to Fig. 1-21
Fig. 1-20  ■ From Jupiter JB: Flynn's Hand surgery, ed 4, Philadelphia, 1991, Williams & Wilkins.

**CLINICAL GEM:**
Tenderness in the snuffbox may indicate a scaphoid fracture.

37. In the forearm, at the level of the elbow, which three veins make the M shape?

A. Median cubital vein, basilic vein, and lateral cutaneous vein  
B. Basilic vein, cephalic vein, and median cubital vein  
C. Cephalic vein, lateral cutaneous vein, and basilic vein  
D. None of the above

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Fig. 1-21  ■ From Smith AA, Lacey SH: Hand surgery review, St Louis, 1996, Mosby.
The cephalic vein that runs on the lateral (radial) aspect of the upper extremity and the basilic vein that travels along the medial (ulnar) upper extremity form an M shape with the median cubital vein at the elbow.

Answer: B
Hunter, Mackin, Callahan, p. A-17
Hunter in Mackin, Callahan, Skirven, et al, p. 19
Refer to Fig. 1-22

Definitions
A. An adventitious sound heard on auscultation and of venous or arterial origin
B. An abnormal tremor that accompanies a vascular or cardiac murmur felt on palpation
C. Localized abnormal dilation of a blood vessel, usually an artery
D. A benign tumor of dilated blood vessels
E. A sensitive noninvasive technique for determining blood flow

Answers: 1, B; 2, A; 3, C, 4, E; 5, D
Taber’s Cyclopedic Medical Dictionary

39. What is the space of Poirier?
A. A gap between the scaphoid and lunate bones
B. An area of avascularity in the scaphoid
C. Weakness from an absence of ligamentous support
D. T-shaped ligaments over the hamate and triquetrum

The volar wrist capsule often contains an area of weakness called the space of Poirier. This weakness is caused by the absence of a volar lunocapitate ligament. Some authors report that this lack of ligament support causes wrist instability.

Answer: C
Taleisnik, p. 25
Refer to Fig. 1-23

38. Match the following vascular terms with the correct definitions.

Terms
1. Thrill
2. Bruit
3. Aneurysm
4. Doppler echocardiography
5. Hemangioma

40. Blood supply to the thumb comes primarily from which of the following?
A. The superficial branch of the ulnar artery
B. The deep branch of the radial artery
C. The superficial branch of the radial artery
D. The deep branch of the ulnar nerve
The deep branch of the radial artery provides the primary blood supply to the thumb.

Answer: B
Hunter, Mackin, Callahan, pp. 34-35

41. Place the correct nerve innervation next to the muscle.

Key

1. Radial nerve = R
2. Median nerve = M
3. Ulnar nerve = U

Muscle

A. Extensor pollicis longus
B. Extensor pollicis brevis
C. Abductor pollicis longus
D. Abductor pollicis brevis
E. Adductor pollicis
F. Flexor pollicis longus
G. Flexor pollicis brevis
H. Volar interossei
I. Dorsal interossei
J. Lumbricals II and III
K. Lumbricals V and IV

Answer: A, R; B, R; C, R; D, M; E, U; F, M; G, M; H, U; I, U; J, M; K, U
Omer, Spinner, Van Beek, pp. 42-47
Refer to Table 1-1

42. Which of the following is not a sign of arterial insufficiency?

A. Pallor
B. Decreased temperature
C. Sluggish capillary refill
D. Cyanosis

Answer: D
Green, pp. 1342-1343
Refer to Fig. 1-24

Arterial insufficiency results in pallor (lack of color), decreased temperature, increased pain, slow capillary refill, and loss of pulse. Venous insufficiency is recognized by cyanosis (bluish discoloration of the skin caused by reduced amounts of hemoglobin in the blood) and abnormal capillary refill. Excessive elevation above the level of the heart can stress the arterial system during the acute phase and should be avoided. Elevation at the level of the heart is the recommended position. In general, slight elevation above the heart is beneficial for venous stasis, and slight lowering below the heart is helpful for arterial system management.

Answer: D
Hunter, Mackin, Callahan, pp. 1059, 1092
Pettengill in Mackin, Callahan, Skirven, et al, pp. 1413-1418

43. What is the lacertus fibrosus?

A. Part of the arcade of Frohse
B. Continuation of the arcade of Struthers
C. The ligament of Struthers
D. Synonymous with the bicipital aponeurosis

The lacertus fibrosus is another name for the bicipital aponeurosis. It is a fibrous band that originates from the tendon of biceps brachii. The lacertus fibrosus is tightened with pronation. Active flexion of the elbow in conjunction with pronation may contribute to compression of the median nerve at the lacertus fibrosus.

Answer: D
Green, pp. 1342-1343
Refer to Fig. 1-24
<table>
<thead>
<tr>
<th>Nerves</th>
<th>Branch</th>
<th>Muscle innervation</th>
<th>Sensory distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dorsal scapular, C4-C5</td>
<td>Lateral, brachial, cutaneous</td>
<td>Rhomboid major, rhomboid minor, levator scapulae</td>
<td>None</td>
</tr>
<tr>
<td>Suprascapular, C4-C6</td>
<td></td>
<td>Supraspinatus, infraspinatus</td>
<td>None</td>
</tr>
<tr>
<td>Nerve to subclavius, C5</td>
<td></td>
<td>Subclavius</td>
<td>None</td>
</tr>
<tr>
<td>Subscapular, C5-C7</td>
<td></td>
<td>Teres major</td>
<td>None</td>
</tr>
<tr>
<td>Long thoracic, C5-C7</td>
<td></td>
<td>Serratus anterior</td>
<td>None</td>
</tr>
<tr>
<td>Thoracodorsal, C6-C8</td>
<td></td>
<td>Latissimus dorsi</td>
<td>None</td>
</tr>
<tr>
<td>Lateral pectoral, C6</td>
<td></td>
<td>Pectoralis major, pectoralis minor</td>
<td>None</td>
</tr>
<tr>
<td>Medial pectoral, C7-C8</td>
<td></td>
<td>Pectoralis major, pectoralis minor</td>
<td>None</td>
</tr>
<tr>
<td>Axillary, C5-C6</td>
<td></td>
<td>Deltoid, teres minor</td>
<td>Over deltoid, lateral aspect of upper arm, lateral portion of shoulder joint</td>
</tr>
<tr>
<td>Musculocutaneous, C5-C7</td>
<td>Lateral antebrachial cutaneous</td>
<td>Biceps brachii, brachialis, coracobrachialis (together with radial nerve), pronator teres</td>
<td>Volar radial forearm to wrist; may extend to thenar eminence</td>
</tr>
<tr>
<td>Medial brachial cutaneous</td>
<td></td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>(medial cord) C8-T1</td>
<td></td>
<td></td>
<td>Medical aspect of upper arm</td>
</tr>
<tr>
<td>Radial, C5-C8</td>
<td>Posterior interosseous</td>
<td>Triceps brachii, brachioradialis, anconeus, extensor carpi radialis (brevis and longus), extensor digitorum communis II-V, brachialis, supinator, extensor carpi ulnaris, extensor digiti minimi, extensor pollicis longus, extensor pollicis brevis, extensor indicis proprius</td>
<td>Dorsal distal upper arm</td>
</tr>
<tr>
<td></td>
<td>Posterior, brachial, cutaneous, antebraclial, cutaneous, superficial, radial</td>
<td></td>
<td>Dorsal radial forearm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dorsal first web space</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Radial dorsum of hand, wrist joint</td>
</tr>
<tr>
<td>Medial antebrachial cutaneous, C8-T1</td>
<td>Anterior ulnar</td>
<td>Pronator teres, pronator quadratus, flexor carpi radialis, palmaris longus, flexor palm and radial fingers profundus (second and third), flexor pollicis longus, abductor pollicis brevis, flexor pollicis brevis (superficial head), opponens pollicis, lumbricales (first and second)</td>
<td>Pulp of thumb and index, proximal palm and thenar eminence, radial</td>
</tr>
<tr>
<td>(medial cord)</td>
<td></td>
<td></td>
<td>Ulnar forearm</td>
</tr>
<tr>
<td>Median, C5-T1</td>
<td>Anterior interosseous</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recurrent motor branch</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palmar cutaneous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulnar, C8-T1</td>
<td>Superficial palmar</td>
<td>Flexor carpi ulnaris, flexor pollicis brevis (deep head), flexor digitorum profundus (fourth and fifth), flexor digiti minimi brevis, opponens digiti minimi, palmaris brevis, adductor pollicis, flexor pollicis brevis, abductor digiti, lumbricales (third and fourth), interosseous</td>
<td>Pulp of little finger, dorsal ulnar surface of hand, ulnar palm, and ulnar fingers</td>
</tr>
</tbody>
</table>

*Italicics: Key muscles, most reliable sensory distribution.*

44. Match the following terms with the correct definitions.

Terms
1. Fascia
2. Muscle
3. Sprain
4. Strain
5. Erythematous

Definitions
A. Injury to the joint with ligamentous damage
B. Injury to the muscle or musculotendinous unit
C. A fibrous membrane that covers, supports, and separates muscles
D. A type of tissue composed of contractile fibers
E. Dry, pink patches of skin that are itchy and burn


Taber's Cyclopedic Medical Dictionary

45. Which of the following muscles does not originate from the common flexor origin on the medial epicondyle of the humerus?

A. Pronator quadratus  
B. Flexor carpi radialis  
C. Flexor digitorum superficialis  
D. Flexor carpi ulnaris  
E. Pronator teres

Muscles originating from the common flexor origin include the pronator teres, flexor carpi radialis, flexor digitorum superficialis, palmaris longus, and flexor carpi ulnaris. Pronator quadratus is a distal forearm muscle that originates from the distal ulna.

Answer: A

Hoppenfeld, de Boer, p. 102

46. The basilic vein and the brachial vein form which vein?

A. Axillary vein  
B. Cephalic vein  
C. Thoracoepigastric vein  
D. Thoracodorsal vein

The basilic vein joins the brachial vein at the lower border of the teres major and goes on to form the axillary vein. The axillary vein is termed the subclavian vein at the first rib.

Answer: Axillary vein

Hunter, Mackin, Callahan, p. A12
Refer to Fig. 1-25

47. True or false: All vein grafts should be marked and reversed when they are used in arterial reconstruction.

Both veins and arteries have been used for interposition grafts and microsurgery, but venous grafts are more readily available and appear to have the highest patency rate. All vein grafts should be marked and reversed when they are used in arterial reconstruction because even the smallest digital vessels have been shown to contain valves. Veins have valves that prevent backward circulation; therefore if veins are not reversed, blood will not flow properly.

Answer: True

Green, p. 1061
48. Which thumb pulley is the most important?

A. A1 pulley
B. Oblique pulley
C. A2 pulley
D. Pulleys are not important in the thumb.

The oblique pulley, which is located in the mid-portion of the proximal phalanx, is the most important pulley. The pulley system in the thumb comprises the A1 pulley located at the MCP joint level, the oblique pulley at the mid-portion of the proximal phalanx, and the A2 pulley located at the IP joint. IP joint motion in the thumb will decrease if the oblique pulley is damaged.

Answer: **B**

Hunter, Mackin Callahan, p. 418
Chase in Mackin, Callahan, Skirven, et al, p. 69
Refer to Fig. 1-26

50. Lister's tubercle is a bony prominence located on which of the following?

A. Scaphoid
B. Proximal ulna
C. Distal radius
D. Distal ulna

Lister's tubercle is located on the distal radius. The extensor pollicis longus (EPL) takes a 45-degree turn around Lister's tubercle, which acts as a pulley on its course to the thumb. Rupture of the EPL is not uncommon in patients with rheumatoid arthritis. The EPL may rupture after a distal radius fracture if the tubercle is disrupted.

Answer: **C**

Hoppenfeld, p. 78

**Clinical Gem:**

The SL ligament can be palpated approximately 1 cm directly distal to Lister's tubercle on the distal radius.

51. Which structure articulates with the cupped surface of the proximal radius?

A. Trochlea
B. Coronoid
C. Capitulum
D. Medial epicondyle

The capitulum is spherical and smaller than the trochlea. The capitulum articulates with the cupped surface of the radius (radial head). The trochlea is shaped like a spool and is superior to the coronoid fossa.

Answer: **C**

Netter, p. 31
Refer to Fig. 1-27

49. Which muscle's function would be affected by a lesion of the posterior interosseous nerve?

A. Brachioradialis
B. Extensor carpi radialis brevis
C. Extensor digitorum
D. All of the above

The extensor digitorum communis is affected as the deep branch of the radial nerve innervates the extensor digitorum communis, abductor pollicis longus, extensor pollicis longus, and extensor pollicis brevis.

Answer: **C**

Hunter, Mackin, Callahan, p. 633
52. Match each muscle with the correct insertion.

**Muscle**

1. Subscapularis
2. Pectoralis major
3. Coracobrachialis
4. Brachialis
5. Supraspinatus

**Insertion**

A. Bicipital groove
B. Coronoid process of ulna
C. Greater tubercle of humerus
D. Shaft of humerus
E. Lesser tubercle of humerus

**Answers:** 1, E; 2, A; 3, D; 4, B; 5, C

Hunter, Mackin, Callahan, pp. 16-18
Hunter in Mackin, Callahan, Skirven, et al, pp. 20-22

53. Which muscle is not included in the wad of Henry?

A. Brachioradialis
B. Supinator
C. Extensor carpi radialis brevis
D. Extensor carpi radialis longus

Hoppenfeld describes the brachioradialis, extensor carpi radialis brevis, and extensor carpi radialis longus as “the mobile wad of Henry” or “mobile wad of three.” These muscles are best palpated as a unit, which is easily held and moves between the fingers. One can assess this group of muscles when the patient’s forearm and wrist are in the neutral position. The supinator is not part of the wad of Henry.

**Answer:** B

Hoppenfeld, p. 47
Refer to Fig. 1-28
54. Match each plane with the correct definition.

**Plane**
1. Coronal plane
2. Frontal plane
3. Sagittal plane
4. Transverse plane

**Definition**
A. Another name for coronal plane
B. Divides the body into superior and inferior portions at right angles to the long axis of the body
C. Divides the body into right and left parts; called the median plane
D. Divides the body into front and back portions

**Answers:** 1, D; 2, A or D; 3, C; 4, B

55. Which of the following statements is false with regard to the blood supply to the hand?

A. The supply of blood to the hand depends on the venous pressure.
B. The arterial system, which brings blood into the hand, is situated on the volar aspect of the hand.
C. The venous and lymphatic system, which returns blood back into the system, is located dorsally.
D. The return flow through the veins and lymphatics normally depends on active movement of the hand and arm, which acts as a pumping mechanism.

Statement A is an incorrect or false statement because it states that the blood supply to the hand depends on arterial pressure, not venous pressure.

**Answer:** A

56. Landsmeer’s ligament is another term for which structure?

A. The oblique retinacular ligament
B. The transverse retinacular ligament
C. The triangular ligament
D. Cleland’s ligament

The oblique retinacular ligament (ORL) was described by Landsmeer in 1949. This ligament coordinates the movement of the interphalangeal joints. The functional value of this ligament is controversial in normal fingers but evident in pathological conditions. The ORL is taut in DIP joint flexion; therefore if this ligament is contracted in extension, the DIP joint is not able to fully flex. When the ORL is contracted, it contributes to the boutonniere deformity.

**Answer:** A

57. True or false: A ligament attaches a muscle to a bone.

A ligament is a band or sheet of strong, fibrous, connective tissue that connects the articular ends of bones; it binds them together and facilitates or limits motion. A tendon is a fibrous, connective tissue that attaches muscle to bone.

**Answer:** False

58. A fingerprint is made from which of the following?

A. Reticular dermis
B. Skin bulging
C. Papillary ridges
D. Oil in the fingertips

**Answers:** 1, 3; 2, 4
Fingerprints are formed from cutaneous striations that are reflective of organized papillary ridges in the underlying dermis. The reticular dermis is incorrect because it is a deeper layer that comprises collagen and elastic fibers.

Answer: C

Tubiana, Thomine, Mackin, p. 131
Refer to Fig. 1-30

59. Which of the following is the term for the white area at the base of the fingernail?

A. Hyponychium
B. Eponychium
C. Paronychia
D. Lunula

The lunula is the white convex area seen at the base of the nail. The hyponychium is under the nail bed. The eponychium is the embryonic structure from which the nail develops. A paronychia is an acute or chronic infection around the nail.

Answer: D

Tubiana, Thomine, Mackin, p. 151
Taber’s Cyclopedic Medical Dictionary

60. Results of Allen’s test are considered abnormal when the reflow into all or part of the hand takes longer than what amount of time?

A. 1 second
B. 3 seconds
C. 5 seconds
D. 7 seconds

7 seconds is the baseline to determine latent reflow. Slowness of more than 7 seconds indicates inadequate flow due to obstruction or anomaly. The Allen’s test can also be used to assess digital flow. Testing to measure return of flow can be supplemented by laser Doppler flowmetry and pressure manometry.

Answer: D

Kasdan, Amadio, Bowers, p. 282
Aulicino in Mackin, Callahan, Skirven, et al, pp. 140-141
Refer to Fig. 1-31

61. Pain is present in approximately two thirds of patients with upper extremity vascular disease. Match the cause of vascular disease-related pain with the appropriate symptoms.

**Cause**

A. Sudden arterial occlusion
B. Vasospasm
C. Obstructive arterial problem
D. Severe arterial insufficiency
62. **Label Fig. 1-32.**

1. Distal phalanx
2. Hyponychium
3. Nail bed
4. Eponychium
5. Nail plate

63. **The palmaris longus is absent in what percent of the population?**

- A. 30% to 40%
- B. 5% to 8%
- C. 13% to 20%
- D. 75% to 85%

The palmaris longus is absent in 13% to 20% of the population. It originates from the medial epicondyle of the humerus and inserts into the palmar aponeurosis. The palmaris longus tendon is easily detected as it courses over the transverse carpal ligament. This tendon often is sacrificed when tendon transfers are performed.

64. **The fingernails of digits two and three receive their sensation from which nerve?**
As the proper digital nerves pass toward their destination in the pad of the finger, they give off branches for the innervation of the skin on the dorsum of the fingers and matrices of the fingernails. Digital nerves for the first, second, third, and half of the fourth fingers are median nerve-innervated.

Answer: A
Netter, p. 58

65. The “attitude” of the hand in Fig. 1-33, A, depicts which of the following?

A. Position of rest
B. Lumbrical plus position
C. Intrinsic minus position
D. Intrinsic plus position

The “attitude” of the hand is an important factor to evaluate. The position of rest occurs when the metacarpophalangeal joints and the interphalangeal joints are slightly flexed and the fingers line up almost parallel to each other (Fig. 1-33, A). If one finger is extended (perpendicular to the others), its flexor tendon may have been damaged (Fig. 1-33, B).

Answer: A
Hoppenfeld, p. 61

66. Which of the following would patients with vascular disease not experience?

A. Color changes
B. Cold intolerance
C. Stiffness in the digits after exposure to cold
D. Mild to severe pain that is relieved when the hand is warmed
E. Patients may experience all the above symptoms.
Patients with vascular disease, such as Raynaud’s phenomenon, may complain of fingertips turning white then bluish, and redness may be reported when blood flow returns to the digits. Many of these patients will complain of pain when the extremity is cold. The pain is relieved when the extremity is warmed, but stiffness in the digits may follow warming of the extremity.

Answer: E
Kasdan, Amadio, Bowers, pp. 282-283
Hunter, Mackin, Callahan, p. 962

67. Ligaments about the elbow provide roughly what percent of joint stability?

A. 25%
B. 50%
C. 75%
D. 90%

Roughly half of elbow joint stability is provided by ligaments. Acute or recurrent instability can occur medially or posterolaterally. An acute tear of the medial collateral ligament is the most common isolated ligament injury of the elbow.

Answer: B
Varitimidis, pp. 66-71
Barnes, Tullos, pp. 62-67

68. Match the following muscles with their actions.

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Middle deltoid</td>
<td>A. Protraction, depression, and downward rotation of the scapula</td>
</tr>
<tr>
<td>2. Upper trapezius</td>
<td>B. Flexion and adduction of the humerus</td>
</tr>
<tr>
<td>3. Latissimus dorsi</td>
<td>C. Elevation and upward rotation of scapula</td>
</tr>
<tr>
<td>4. Coracobrachialis</td>
<td>D. Extension, internal rotation, and adduction of the humerus</td>
</tr>
<tr>
<td>5. Pectoralis minor</td>
<td>E. Abduction of humerus to 90 degrees</td>
</tr>
</tbody>
</table>

Answers: 1, E; 2, C; 3, D; 4, B; 5, A
Sieg, Adams, p. 30