# The Palm of the Hand

### Skin

The skin of the palm of the hand is thick and hairless. It is bound down to the underlying deep fascia by numerous fibrous bands. The skin shows many flexure creases at the sites of skin movement, which are not necessarily placed at the site of joints. Sweat glands are present in large numbers.

The **palmaris brevis** (Fig. 9.55) is a small muscle that arises from the flexor retinaculum and palmar aponeurosis and is inserted into the skin of the palm. It is supplied by the superficial branch of the ulnar nerve. Its function is to corrugate the skin at the base of the hypothenar eminence and so improve the grip of the palm in holding a rounded object.

The sensory nerve supply to the skin of the palm (Figs. 9.38 and 9.55) is derived from the palmar cutaneous branch of the median nerve, which crosses in front of the

flexor retinaculum and supplies the lateral part of the palm, and the **palmar cutaneous branch of the ulnar nerve;** the latter nerve also crosses in front of the flexor retinaculum (Fig. 9.54) and supplies the medial part of the palm.

The skin over the base of the thenar eminence is supplied by the **lateral cutaneous nerve of the forearm** or the **superficial branch of the radial nerve** (Fig. 9.38).

# Deep Fascia

The deep fascia of the wrist and palm is thickened to form the **flexor retinaculum** (described on page XXX) and the **palmar aponeurosis.** 

# The Palmar Aponeurosis

The palmar aponeurosis is triangular and occupies the central area of the palm (Fig. 9.55). The apex of the palmar aponeurosis is attached to the distal border of the flexor retinaculum and receives the insertion of the palmaris longus tendon (Fig. 9.55). The base of the aponeurosis divides at the bases of the fingers into four slips. Each slip divides into two bands, one passing superficially to the skin and the other passing deeply to the root of the finger; here each deep band divides into two, which diverge around the flexor tendons and finally fuse with the fibrous flexor sheath and the deep transverse ligaments.

The medial and lateral borders of the palmar aponeurosis are continuous with the thinner deep fascia covering the hypothenar and thenar muscles. From each of these borders, fibrous septa pass posteriorly into the palm and take part in the formation of the palmar fascial spaces (see page 404).

The function of the palmar aponeurosis is to give firm attachment to the overlying skin and so improve the grip and to protect the underlying tendons.



# CLINICAL NOTES

#### **Dupuytren's Contracture**

Dupuytren's contracture is a localized thickening and contracture of the palmar aponeurosis, which limits hand function and may eventually disable the hand. It commonly starts near the root of the ring finger and draws that finger into the palm, flexing it at the metacarpophalangeal joint. Later, the condition involves the little finger in the same manner. In long-standing cases, the pull on the fibrous sheaths of these fingers results in flexion of the proximal interphalangeal joints. The distal interphalangeal joints are not involved and are actually extended by the pressure of the fingers against the palm.

Surgical division of the fibrous bands followed by physiotherapy to the hand is the usual form of treatment. The alternative treatment of injection of the enzyme collagenase into the contracted bands of fibrous tissue has been shown to significantly reduce the contractures and improve mobility.

# The Carpal Tunnel

The carpus is deeply concave on its anterior surface and forms a bony gutter. The gutter is converted into a tunnel by the flexor retinaculum (Fig. 9.54).

The long flexor tendons to the fingers and thumb pass through the tunnel and are accompanied by the median nerve. The four separate tendons of the flexor digitorum superficialis muscle are arranged in anterior and posterior rows, those to the middle and ring fingers lying in front of those to the index and little fingers. At the lower border of the flexor retinaculum, the four tendons diverge and become arranged on the same plane (Fig. 9.62).

The tendons of the flexor digitorum profundus muscle are on the same plane and lie behind the superficialis tendons.

All eight tendons of the flexor digitorum superficialis and profundus invaginate a common synovial sheath from the lateral side (Fig. 9.54). This allows the arterial supply to the tendons to enter them from the lateral side.

The tendon of the flexor pollicis longus muscle runs through the lateral part of the tunnel in its own synovial sheath.

The median nerve passes beneath the flexor retinaculum in a **restricted** space between the flexor digitorum superficialis and the flexor carpi radialis muscles (Fig. 9.54).



#### **Carpal Tunnel Syndrome**

The carpal tunnel, formed by the concave anterior surface of the carpal bones and closed by the flexor retinaculum, is tightly packed with the long flexor tendons of the fingers, with their surrounding synovial sheaths, and the median nerve (Fig. 9.54). Clinically, the syndrome consists of a burning pain or "pins and needles" along the distribution of the median nerve to the lateral three and a half fingers and weakness of the thenar muscles. It is produced by compression of the median nerve within the tunnel. The exact cause of the compression is difficult to determine, but thickening of the synovial sheaths of the flexor tendons or arthritic changes in the carpal bones are thought to be responsible in many cases. As you would expect, no paresthesia occurs over the thenar eminence because this area of skin is supplied by the palmar cutaneous branch of the median nerve, which passes superficially to the flexor retinaculum. The condition is dramatically relieved by decompressing the tunnel by making a longitudinal incision through the flexor retinaculum.

# **Fibrous Flexor Sheaths**

The anterior surface of each finger, from the head of the metacarpal to the base of the distal phalanx, is provided with a strong fibrous sheath that is attached to the sides of the phalanges (Fig. 9.66). The proximal end of the fibrous sheath is open, whereas the distal end of the sheath is closed and is attached to the base of the distal phalanx. The sheath and the bones form a blind tunnel in which the flexor tendons of the finger lie.



**FIGURE 9.66** Anterior view of the palm of the hand showing the flexor synovial sheaths. Cross section of a finger is also shown.

In the thumb, the osteofibrous tunnel contains the tendon of the flexor pollicis longus. In the case of the four medial fingers, the tunnel is occupied by the tendons of the flexor digitorum superficialis and profundus (Fig. 9.66). The fibrous sheath is thick over the phalanges but thin and lax over the joints.

# Synovial Flexor Sheaths

In the hand, the tendons of the flexor digitorum superficialis and profundus muscles invaginate a common synovial sheath from the lateral side (Fig. 9.54). The medial part of this common sheath extends distally without interruption on the tendons of the little finger. The lateral part of the sheath stops abruptly on the middle of the palm, and the distal ends of the long flexor tendons of the index, the middle, and the ring fingers acquire **digital synovial sheaths** as they enter the fingers. The flexor pollicis longus tendon has its own synovial sheath that passes into the thumb. These sheaths allow the long tendons to move smoothly, with a minimum of friction, beneath the flexor retinaculum and the fibrous flexor sheaths.

The synovial sheath of the flexor pollicis longus (sometimes referred to as the **radial bursa**) communicates with the common synovial sheath of the superficialis and profundus tendons (sometimes referred to as the **ulnar bursa**) at the level of the wrist in about 50% of subjects.

The **vincula longa** and **brevia** are small vascular folds of synovial membrane that connect the tendons to the anterior surface of the phalanges (Fig. 9.63). They resemble a mesentery and convey blood vessels to the tendons.

# CLINICAL NOTES

#### Tenosynovitis of the Synovial Sheaths of the Flexor Tendons

Tenosynovitis is an infection of a synovial sheath. It most commonly results from the introduction of bacteria into a sheath through a small penetrating wound, such as that made by the point of a needle or thorn. Rarely, the sheath may become infected by extension of a pulp-space infection.

Infection of a digital sheath results in distention of the sheath with pus; the finger is held semiflexed and is swollen. Any attempt to extend the finger is accompanied by extreme pain because the distended sheath is stretched. As the inflammatory process continues, the pressure within the sheath rises and may compress the blood supply to the tendons that travel in the vincula longa and brevia (Fig. 9.63). Rupture or later severe scarring of the tendons may follow.

A further increase in pressure can cause the sheath to rupture at its proximal end. Anatomically, the digital sheath of the index finger is related to the thenar space, whereas that of the ring finger is related to the midpalmar space. The sheath for the middle finger is related to both the thenar and midpalmar spaces.

# Insertion of the Long Flexor Tendons

Each tendon of the flexor digitorum superficialis enters the fibrous flexor sheath; opposite the proximal phalanx it divides into two halves, which pass around the profundus tendon and meet on its deep or posterior surface, where partial decussation of the fibers takes place (Fig. 9.63). The superficialis tendon, having united again, divides almost at once into two further slips, which are attached to the borders of the middle phalanx. Each tendon of the flexor digitorum profundus, having passed through the division of the superficialis tendon, continues downward, to be inserted into the anterior surface of the base of the distal phalanx (Fig. 9.63).

# 💕 CLINICAL NOTES

#### **Trigger Finger**

In trigger finger, there is a palpable and even audible snapping when a patient is asked to flex and extend the fingers. It is caused by the presence of a localized swelling of one of the long flexor tendons that catches on a narrowing of the fibrous flexor sheath anterior to the metacarpophalangeal joint. It may take place either in flexion or in extension. A similar condition occurring in the thumb is called **trigger thumb**. The situation can be relieved surgically by incising the fibrous flexor sheath.

# Small Muscles of the Hand

The small muscles of the hand include the four lumbrical muscles, the eight<sup>1</sup> interossei muscles, the short muscles of the thumb, and the short muscles of the little finger. The muscles are seen in Figures 9.55, 9.67, 9.68, and 9.69 and are described in Table 9.9.

These relationships explain how infection can extend from the digital synovial sheaths and involve the palmar fascial spaces.

In the case of infection of the digital sheaths of the little finger and thumb, the ulnar and radial bursae are quickly involved. Should such an infection be neglected, pus may burst through the proximal ends of these bursae and enter the fascial space of the forearm between the flexor digitorum profundus anteriorly and the pronator quadratus and the interosseous membrane posteriorly. This fascial space in the forearm is commonly referred to clinically as the **space of Parona**.

# Short Muscles of the Thumb

The short muscles of the thumb are the abductor pollicis brevis, the flexor pollicis brevis, the opponens pollicis, and the adductor pollicis (Figs. 9.59, 9.62, and 9.67). The first three of these muscles form the **thenar eminence**.

#### **Opposition of the Thumb**

It should be noted that the opponens pollicis muscle pulls the thumb medially and forward across the palm so that the palmar surface of the tip of the thumb may come into contact with the palmar surface of the tips of the other fingers. It is an important muscle and enables the thumb to form one claw in the pincer-like action used for picking up objects. This complex movement involves a flexion of the carpometacarpal and metacarpophalangeal joints and a small amount of abduction and medial rotation of the metacarpal bone at the carpometacarpal joint.

#### **Abduction of the Thumb**

Abduction of the thumb may be defined as a movement forward of the thumb in the anteroposterior plane. It takes place at the carpometacarpal joint and the metacarpophalangeal joint.

#### Adduction of the Thumb

This movement can be defined as a movement backward of the abducted thumb in the anteroposterior plane. It restores the thumb to its anatomic position, which is flush with the palm. The adductor pollicis is the muscle that, in association with the flexor pollicis longus and the opponens pollicis muscles, is largely responsible for the power of the pincers grip of the thumb. Adduction of the thumb occurs at the carpometacarpal and at the metacarpophalangeal joint.

# Short Muscles of the Little Finger

The short muscles of the little finger are the abductor digiti minimi, the flexor digiti minimi brevis, and the opponens digiti minimi, which together form the **hypothenar eminence** (Figs 9.59, 9.62, and 9.67).

#### **Opposition of the Little Finger**

The opponens digiti minimi muscle is only capable of rotating the fifth metacarpal bone to a slight degree. However,

<sup>&</sup>lt;sup>1</sup>There are eight interossei, consisting of four dorsal and four palmar muscles. Some authors describe only three palmar interossei and state that the first palmar interosseous is in reality a second head to the flexor pollicis brevis: others believe that it is part of the adductor pollicis muscle.







**FIGURE 9.68** Anterior view of the palm of the hand showing the deep palmar arch and the deep terminal branch of the ulnar nerve. The interossei are also shown.



FIGURE 9.69 Origins and insertion of the palmar and the dorsal interossei muscles. The actions of these muscles are also shown.

it assists the flexor digiti minimi in flexing the carpometacarpal joint of the little finger, thereby pulling the fifth metacarpal bone forward and cupping the palm.

# Arteries of the Palm

#### Ulnar Arterv

The ulnar artery enters the hand anterior to the flexor retinaculum on the lateral side of the ulnar nerve and the pisiform bone (Fig. 9.62). The artery gives off a deep branch and then continues into the palm as the superficial palmar arch.

The superficial palmar arch is a direct continuation of the ulnar artery (Fig. 9.62). On entering the palm, it curves laterally behind the palmar aponeurosis and in front of the long flexor tendons. The arch is completed on the lateral side by one of the branches of the radial artery. The curve of the arch lies across the palm, level with the distal border of the fully extended thumb.

Four digital arteries arise from the convexity of the arch and pass to the fingers (Fig. 9.62).

The deep branch of the ulnar artery arises in front of the flexor retinaculum, passes between the abductor digiti minimi and the flexor digiti minimi, and joins the radial artery to complete the deep palmar arch (Figs. 9.67 and 9.68).

TABLE 9.9 Small Muscles of the Hand						
Muscle	Origin	Insertion	Nerve Supply	Nerve Roots <sup>a</sup>	Action	
Palmaris brevis	Flexor retinaculum, palmar aponeurosis	Skin of palm	Superficial branch of ulnar nerve	C8; <b>T1</b>	Corrugates skin to improve grip of palm	
Lumbricals (4)	Tendons of flexor digitorum profundus	Extensor expansion of medial four fingers	1st and 2nd, (i.e., lateral two) median nerve; 3rd and 4th deep branch of ulnar nerve	C8; <b>T1</b>	Flex metacarpophalangeal joints and extend interphalangeal joints of fingers except thumb	
Interossei (8)						
Palmar (4)	First arises from base of 1st metacarpal; remaining three from anterior surface of shafts of 2nd, 4th, and 5th metacarpals	Proximal phalanges of thumb and index, ring, and little fingers and dorsal extensor expansion of each finger (Fig. 9.69)	Deep branch of ulnar nerve	C8; <b>T1</b>	Palmar interossei adduct fingers toward center of third finger	
Dorsal (4)	Contiguous sides of shafts of metacarpal bones	Proximal phalanges of index, middle, and ring fingers and dorsal extensor expansion (Fig. 9.69)	Deep branch of ulnar nerve	C8; <b>T1</b>	Dorsal interossei abduct fingers from center of third finger; both palmar and dorsal flex metacarpophalangeal joints and extend interphalangeal joints	

(continued)

Muscle	Origin	Insertion	Nerve Supply	Nerve Roots <sup>a</sup>	Action		
Short Muscles of T Abductor pollicis brevis	<b>'humb</b> Scaphoid, trapezium, flexor retinaculum	Base of proximal phalanx of thumb	Median nerve	<b>C8;</b> T1	Abduction of thumb		
Flexor pollicis brevis	Flexor retinaculum	Base of proximal phalanx of thumb	Median nerve	C8; T1	Flexes metacarpophalangeal joint of thumb		
Opponens pollicis	Flexor retinaculum	Shaft of metacarpal bone of thumb	Median nerve	<b>C8;</b> T1	Pulls thumb medially and forward across palm		
Adductor pollicis	Oblique head; 2nd and 3rd metacarpal bones; transverse head; 3rd metacarpal bone	Base of proximal phalanx of thumb	Deep branch of ulnar nerve	C8; <b>T1</b>	Adduction of thumb		
Short Muscles of L	ittle Finger						
Abductor digiti minimi	Pisiform bone	Base of proximal phalanx of little finger	Deep branch of ulnar nerve	C8; <b>T1</b>	Abducts little finger		
Flexor digiti minimi	Flexor retinaculum	Base of proximal phalanx of little finger	Deep branch of ulnar nerve	C8; <b>T1</b>	Flexes little finger		
Opponens digiti minimi	Flexor retinaculum	Medial border fifth metacarpal bone	Deep branch of ulnar nerve	C8; <b>T1</b>	Pulls 5th metacarpal forward as in cupping the palm		

#### TABLE 9.9 Small Muscles of the Hand (continued)

<sup>a</sup>The predominant nerve root supply is indicated by boldface type.

#### **Radial Artery**

The radial artery leaves the dorsum of the hand by turning forward between the proximal ends of the first and second metacarpal bones and the two heads of the first dorsal interosseous muscle (see page 406). On entering the palm, it curves medially between the oblique and transverse heads of the adductor pollicis and continues as the deep palmar arch (Figs. 9.67 and 9.68).

The **deep palmar arch** is a direct continuation of the radial artery (Fig. 9.68). It curves medially beneath the long flexor tendons and in front of the metacarpal bones and the interosseous muscles. The arch is completed on the medial side by the deep branch of the ulnar artery. The curve of the arch lies at a level with the proximal border of the extended thumb.

The deep palmar arch sends branches superiorly, which take part in the anastomosis around the wrist joint, and inferiorly, to join the digital branches of the superficial palmar arch.

#### Branches of the Radial Artery in the Palm

Immediately on entering the palm, the radial artery gives off the **arteria radialis indicis**, which supplies the lateral side of the index finger, and the **arteria princeps pollicis**, which divides into two and supplies the lateral and medial sides of the thumb.

# Veins of the Palm

Superficial and deep palmar arterial arches are accompanied by superficial and deep palmar venous arches, receiving corresponding tributaries.

# Lymph Drainage of the Palm

The lymph vessels of the fingers pass along their borders to reach the webs. From here, the vessels ascend onto the dorsum of the hand. Lymph vessels on the palm form a plexus that is drained by vessels that ascend in front of the forearm or pass around the medial and lateral borders to join vessels on the dorsum of the hand.

The lymph from the medial side of the hand ascends in vessels that accompany the basilic vein; they drain into the **supratrochlear nodes** and then ascend to drain into the **lateral axillary nodes**. The lymph from the lateral side of the hand ascends in vessels that accompany the cephalic vein; they drain into the **infraclavicular nodes**, and some drain into the **lateral axillary nodes**.

# Nerves of the Palm

#### **Median Nerve**

The median nerve enters the palm by passing **behind** the flexor retinaculum and through the **carpal tunnel**. It immediately divides into lateral and medial branches.

The **muscular branch** takes a recurrent course around the lower border of the flexor retinaculum and lies about one fingerbreadth distal to the tubercle of the scaphoid; it supplies the muscles of the thenar eminence (the abductor pollicis brevis, the flexor pollicis brevis, and the opponens pollicis) and the 1st lumbrical muscle.

The **cutaneous branches** supply the palmar aspect of the lateral three and a half fingers and the distal half of the dorsal aspect of each finger. One of these branches also supplies the second lumbrical muscle.

Note also that the **palmar cutaneous branch** of the median nerve given off in the front of the forearm (Fig. 9.55) crosses **anterior** to the flexor retinaculum and supplies the skin over the lateral part of the palm (Fig. 9.38).

#### **Ulnar Nerve**

The ulnar nerve enters the palm **anterior** to the flexor retinaculum alongside the lateral border of the pisiform bone (Figs. 9.55 and 9.62). As it crosses the retinaculum, it divides into a superficial and a deep terminal branch.

#### Superficial Branch of the Ulnar Nerve

The superficial branch of the ulnar nerve descends into the palm, lying in the subcutaneous tissue between the pisiform bone and the hook of the hamate (Figs. 9.55 and 9.62). The ulnar artery is on its lateral side. Here, the nerve and artery may lie in a fibro-osseous tunnel, the **tunnel of Guyon**, created by fibrous tissue derived from the superficial part of the flexor retinaculum. The nerve may be compressed at this site, giving rise to clinical signs and symptoms.

The nerve gives off the following branches: a **muscular branch** to the palmaris brevis and **cutaneous branches** to the palmar aspect of the medial side of the little finger and the adjacent sides of the little and ring fingers (Fig. 9.62). It also supplies the distal half of the dorsal aspect of each finger.

#### Deep Branch of the Ulnar Nerve

The deep branch of the ulnar nerve runs backward between the abductor digiti minimi and the flexor digiti minimi (Fig. 9.67). It pierces the opponens digiti minimi, winds around the lower border of the hook of the hamate, and passes laterally within the concavity of the deep palmar arch. The nerve lies behind the long flexor tendons and in front of the metacarpal bones and interosseous muscles. It gives off **muscular branches** to the three muscles of the hypothenar eminence, namely, the abductor digiti minimi, the flexor digiti minimi, and the opponens digiti minimi. It supplies all the palmar and dorsal interossei, the 3rd and 4th lumbrical muscles, and both heads of the adductor pollicis muscle. The **palmar cutaneous branch** of the ulnar nerve given off in the front of the forearm crosses **anterior** to the flexor retinaculum (Fig. 9.54) and supplies the skin over the medial part of the palm (Fig. 9.38).

# Fascial Spaces of the Palm

Normally, the fascial spaces of the palm are potential spaces filled with loose connective tissue. Their boundaries are important clinically because they may limit the spread of infection in the palm.

The triangular palmar aponeurosis fans out from the lower border of the flexor retinaculum (Fig. 9.55). From its medial border, a fibrous septum passes backward and is attached to the anterior border of the 5th metacarpal bone (Fig. 9.70). Medial to this septum is a fascial compartment containing the three hypothenar muscles; this compartment is unimportant clinically. From the lateral border of the palmar aponeurosis, a second fibrous septum passes obliquely backward to the anterior border of the third metacarpal bone (Fig. 9.70). Usually, the septum passes between the long flexor tendons of the index and middle fingers. This second septum divides the palm into the thenar space, which lies lateral to the septum (and must not be confused with the fascial compartment containing the thenar muscles), and the midpalmar space, which lies medial to the septum (Fig. 9.70). Proximally, the thenar and midpalmar spaces are closed off from the forearm by the walls of the carpal tunnel. Distally, the two spaces are continuous with the appropriate lumbrical canals (Fig. 9.70).

The **thenar space** contains the first lumbrical muscle and lies posterior to the long flexor tendons to the index finger and in front of the adductor pollicis muscle (Fig. 9.70).

The **midpalmar space** contains the 2nd, 3rd, and 4th lumbrical muscles and lies posterior to the long flexor tendons to the middle, ring, and little fingers. It lies in front of the interossei and the third, fourth, and fifth metacarpal bones (Fig. 9.70).

The **lumbrical canal** is a potential space surrounding the tendon of each lumbrical muscle and is normally filled with connective tissue. Proximally, it is continuous with one of the palmar spaces.



#### **Fascial Spaces of the Palm and Infection**

The fascial spaces of the palm (Fig. 9.70) are clinically important because they can become infected and distended with pus as a result of the spread of infection in acute suppurative tenosynovitis; rarely, they can become infected after penetrating wounds such as falling on a dirty nail.



FIGURE 9.70 Palmar and pulp fascial spaces.

# **Pulp Space of the Fingers**

The deep fascia of the pulp of each finger fuses with the periosteum of the terminal phalanx just distal to the insertion of the long flexor tendons and closes off a fascial compartment known as the **pulp space** (Fig. 9.70). Each pulp space is subdivided by the presence of numerous septa, which pass from the deep fascia to the periosteum. Through the pulp space, which is filled with fat, runs the terminal branch of the digital artery that supplies the diaphysis of the terminal phalanx. The epiphysis of the distal phalanx receives its blood supply proximal to the pulp space.



#### CLINICAL NOTES

#### Pulp-Space Infection (Felon)

The pulp space of the fingers is a closed fascial compartment situated in front of the terminal phalanx of each finger (Fig. 9.70). Infection of such a space is common and serious, occurring most often in the thumb and index finger. Bacteria are usually introduced into the space by pinpricks or sewing needles.

Because each space is subdivided into numerous smaller compartments by fibrous septa, it is easily understood that the accumulation of inflammatory exudate within these compartments causes the pressure in the pulp space to quickly rise. If the infection is left without decompression, infection of the terminal phalanx can occur. In children, the blood supply to the diaphysis of the phalanx passes through the pulp space, and pressure on the blood vessels could result in necrosis of the diaphysis. The proximally located epiphysis of this bone is saved because it receives its arterial supply just proximal to the pulp space.

The close relationship of the proximal end of the pulp space to the digital synovial sheath accounts for the involvement of the sheath in the infectious process when the pulpspace infection has been neglected.

# The Dorsum of the Hand

### Skin

The skin on the dorsum of the hand is thin, hairy, and freely mobile on the underlying tendons and bones.

The sensory nerve supply to the skin on the dorsum of the hand is derived from the superficial branch of the radial nerve and the posterior cutaneous branch of the ulnar nerve.

The **superficial branch of the radial nerve** winds around the radius deep to the brachioradialis tendon, descends over the extensor retinaculum, and supplies the lateral two thirds of the dorsum of the hand (Fig. 9.38). It divides into several dorsal digital nerves that supply the thumb, the index and middle fingers, and the lateral side of the ring finger. The area of skin on the back of the hand and fingers supplied by the radial nerve is subject to variation. Frequently, a dorsal digital nerve, a branch of the ulnar nerve, also supplies the lateral side of the ring finger.

The **posterior cutaneous branch of the ulnar nerve** winds around the ulna deep to the flexor carpi ulnaris tendon, descends over the extensor retinaculum, and supplies the medial third of the dorsum of the hand (Fig. 9.38). It divides into several dorsal digital nerves that supply the medial side of the ring and the sides of the little fingers.

The dorsal digital branches of the radial and ulnar nerves do not extend far beyond the proximal phalanx. The remainder of the dorsum of each finger receives its nerve supply from palmar digital nerves.

# Dorsal Venous Arch (or Network)

The dorsal venous arch lies in the subcutaneous tissue proximal to the metacarpophalangeal joints and drains on the lateral side into the cephalic vein and, on the medial side, into the basilic vein (Fig. 9.100). The greater part of the blood from the whole hand drains into the arch, which receives digital veins and freely communicates with the deep veins of the palm through the interosseous spaces.

# Insertion of the Long Extensor Tendons

The four tendons of the extensor digitorum emerge from under the extensor retinaculum and fan out over the dorsum of the hand (Figs. 9.56 and 9.57). The tendons are embedded in the deep fascia, and together they form the roof of a **subfascial space**, which occupies the whole width of the dorsum of the hand. Strong oblique fibrous bands connect the tendons to the little, ring, and middle fingers, proximal to the heads of the metacarpal bones. The tendon to the index finger is joined on its medial side by the tendon of the extensor indicis, and the tendon to the little finger is joined on its medial side by the two tendons of the extensor digiti minimi (Fig. 9.55).

On the posterior surface of each finger, the extensor tendon joins the fascial expansion called the **extensor expansion** (Figs. 9.56 and 9.57). Near the proximal interphalangeal joint, the extensor expansion splits into three parts: a **central part**, which is inserted into the base of the middle phalanx, and **two lateral parts**, which converge to be inserted into the base of the distal phalanx (Fig. 9.63).

The dorsal extensor expansion receives the tendon of insertion of the corresponding interosseous muscle on each side and farther distally receives the tendon of the lumbrical muscle on the lateral side (Fig. 9.63).



# CLINICAL NOTES

#### **Mallet Finger**

Avulsion of the insertion of one of the extensor tendons into the distal phalanges can occur if the distal phalanx is forcibly flexed when the extensor tendon is taut. The last 20° of active extension is lost, resulting in a condition known as **mallet finger** (Fig. 9.71).

#### **Boutonnière Deformity**

Avulsion of the central slip of the extensor tendon proximal to its insertion into the base of the middle phalanx results in a characteristic deformity (Fig. 9.71C). The deformity results from flexing of the proximal interphalangeal joint and hyperextension of the distal interphalangeal joint. This injury can result from direct end-on trauma to the finger, direct trauma over the back of the proximal interphalangeal joint, or laceration of the dorsum of the finger.

# The Radial Artery on the Dorsum of the Hand

The radial artery winds around the lateral margin of the wrist joint, beneath the tendons of the abductor pollicis longus and extensor pollicis brevis, and lies on the lateral ligament of the joint (Fig. 9.65). On reaching the dorsum of the hand, the artery descends beneath the tendon of the extensor pollicis longus to reach the interval between the two heads of the first dorsal interosseous muscle; here, the artery turns forward to enter the palm of the hand (see page 403).

**Branches of the radial artery on the dorsum of the hand** take part in the anastomosis around the wrist joint. Dorsal digital arteries pass to the thumb and index finger (Fig. 9.65).