Pain Procedures Around the Hand and Wrist

29

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Carpal Tunnel

General

The carpal tunnel is the most common compression neuropathy site. Carpal tunnel syndrome (CTS), also known as median nerve entrapment neuropathy, is classically described by a constellation of symptoms: pain, paresthesias, and thenar atrophy. Compression of the median nerve occurs when pressure increases through the carpal tunnel at the volar aspect of the wrist, either by edema or direct wrist trauma. Entrapment at the carpal tunnel will produce numbness or tingling in the median nerve distribution in the hand which includes the palmar aspect of the thumb, index finger, middle finger, and radial half of the ring finger (Fig. 29.1). Some may have sparing over the thenar palm and little finger. Pain is often worse at night and may be reported to improve with shaking of the hand or "flick sign." High body mass index (BMI) and repetitive wrist movement are associated with increased risk of developing CTS. Provocative maneuvers that reproduce symptoms include carpal compression test, Phalen's sign, and Tinel's sign because they compress the median nerve; however, they are neither sensitive nor specific. Diagnostic studies such as electromyography, nerve conduction studies, and cross-sectional area (CSA) of the median nerve on ultrasound assist in accurately diagnosing CTS. Thenar atrophy is strongly associated with ruling in CTS, but lack of thenar atrophy is not associated with ruling out CTS. Combined history, physical exam, and diagnostic studies support a clinical diagnosis of CTS.

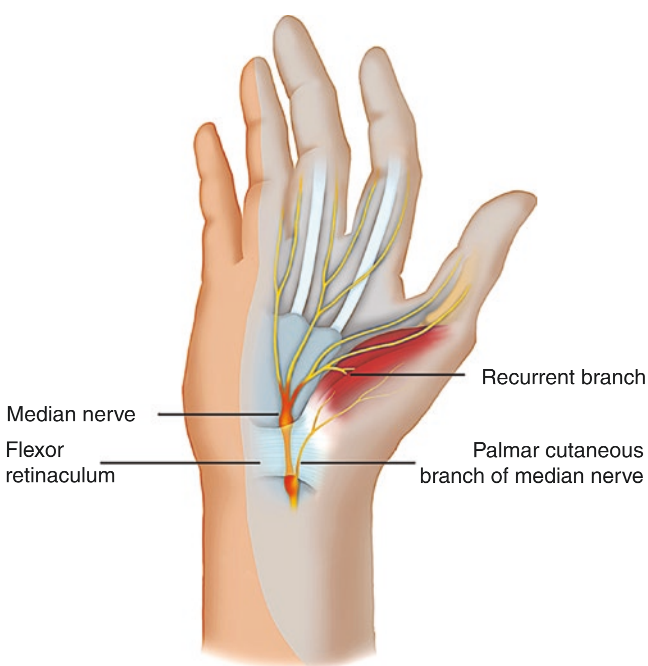

Fig. 29.1 Median nerve entrapment neuropathy. Reprinted with permission from Philip Peng Educational Series

Indications

Corticosteroid injection of the median nerve in the carpal tunnel should be considered in patients who have confirmed CTS based on history, physical exam, and diagnostic studies, who have failed conservative therapy. Conservative therapy includes immobilization with a splint, brace, or orthosis. Avoid injecting if a patient has infection near the injection site such as cellulitis of the overlying skin.

Functional Anatomy

The carpal tunnel is located just distal to the distal wrist crease when observing the volar aspect of the hand and wrist. The lateral border is formed by the scaphoid and trapezium, and the medial border is formed by the pisiform and hamate. The flexor retinaculum, also known as the transverse carpal ligament, extends from the hamate to the trapezium forming the superficial volar border. The median nerve runs within the volar radial area of the carpal tunnel, superficial to the flexor pollicis longus (FPL) tendon and radial to the flexor digitorum superficialis (FDS) tendons and flexor digitorum profundus (FDP) tendons (Fig. 29.2). Key anatomy outside of the carpal tunnel includes the palmaris longus (PL) tendon located at the midpoint of the median crease and the ulnar artery and nerve which lie volar to the flexor retinaculum near its attachment to the hamate. The radial artery is located radial to the trapezium at the distal wrist crease and is therefore not near the flexor retinaculum. The median nerve gives rise to the superficial palmar branch of the median nerve prior to entering the carpal tunnel leading to palmar sparing of sensation.

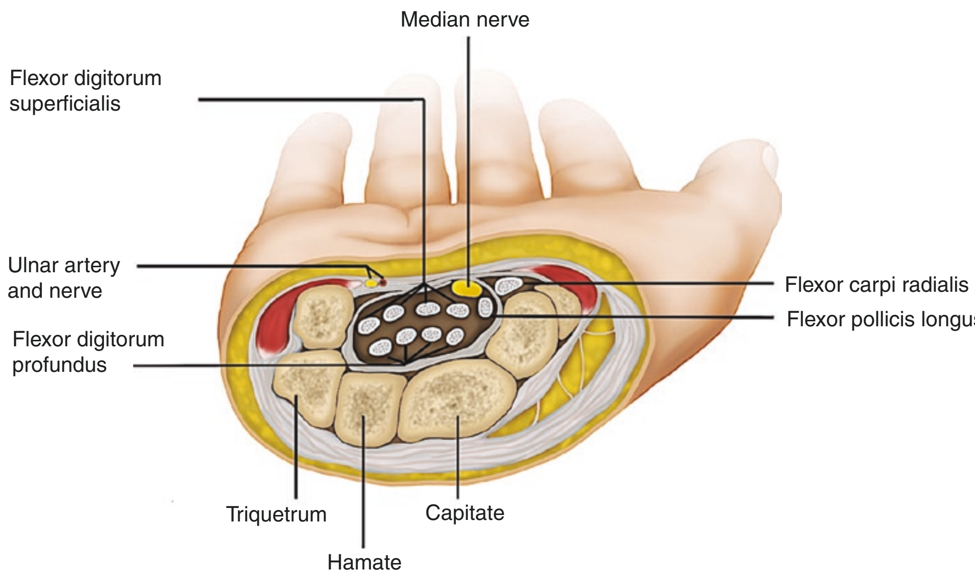

Fig. 29.2 Cross-section anatomy of the carpel tunnel. Reprinted with permission from Philip Peng Educational Series

Technique

Position Seated with arm supinated and resting comfortably on a flat surface. A towel roll can be placed under the wrist to assist in slight wrist extension.

Equipment Ultrasound probe: High-frequency linear array transducer or hockey stick linear probe.

- Needle: 25G or 27G 1.5in needle.
- Injectate: 1–3 mL local anesthetic, 0.5 mL steroid.

Scan Scan in short axis over the distal wrist crease. Identify key anatomy, including the carpal bones bordering the carpal tunnel, the hyperechoic tendons, and the median nerve which will appear as a hypoechoic honeycomb bundle (Fig. 29.3). Scan proximally and distally to clearly identify the course of the median nerve. Tilt the probe to correct for anisotropy. Flex and extend the fingers to observe movement of the tendons within the carpal tunnel. Use color flow to verify the location of the ulnar artery. The optimal position for injection will be where the median nerve is at the level of the pisiform and most superficial within the tunnel.

In-Plane Approach With the probe in short-axis position, in-plane approach is performed from the ulnar side with the needle entering the distal wrist crease parallel to the transducer and just radial or deep to the ulnar artery and nerve (Fig. 29.4). Using a shallow approach, advance the needle into the carpal tunnel toward the median nerve. The needle will appear as a hyperechoic line. When the tip is near the nerve, administer the injectate. Some practitioners prefer to hydrodissect the nerve off of the flexor retinaculum or tendons, while others inject anywhere in the carpal tunnel since it is a confined space and the injectate will spread and saturate the nerve.

Out-of-Plane Approach With the probe in short-axis position, out-of-plane approach is performed with the needle entering distal to the distal crease at a steep angle perpendicular to the transducer and just ulnar to the median nerve (Fig. 29.5). The needle will appear as a hyperechoic dot when the needle tip is directly under the transducer. Administer the injectate next to the median nerve. Hydrodissection is not performed in this approach because the entire needle path cannot be visualized and care should be taken to ensure the needle tip is maintained under the transducer.

Oblique Gel Standoff Technique Place a hockey stick probe in the oblique ulnar position over a thick layer of sterile gel. Stabilize the probe position with the holding hand to ensure the probe does not rest on the skin and maintains a gel buffering layer. Advance the needle in plane through the gel until the needle tip reaches the distal wrist crease. The needle is visualized in plane under the transducer before piercing the skin. Advance the needle into the skin, and continue to visualize the entire needle path as it approaches the median nerve, similar to the in-plane approach previously described. Administer injectate next to the nerve.

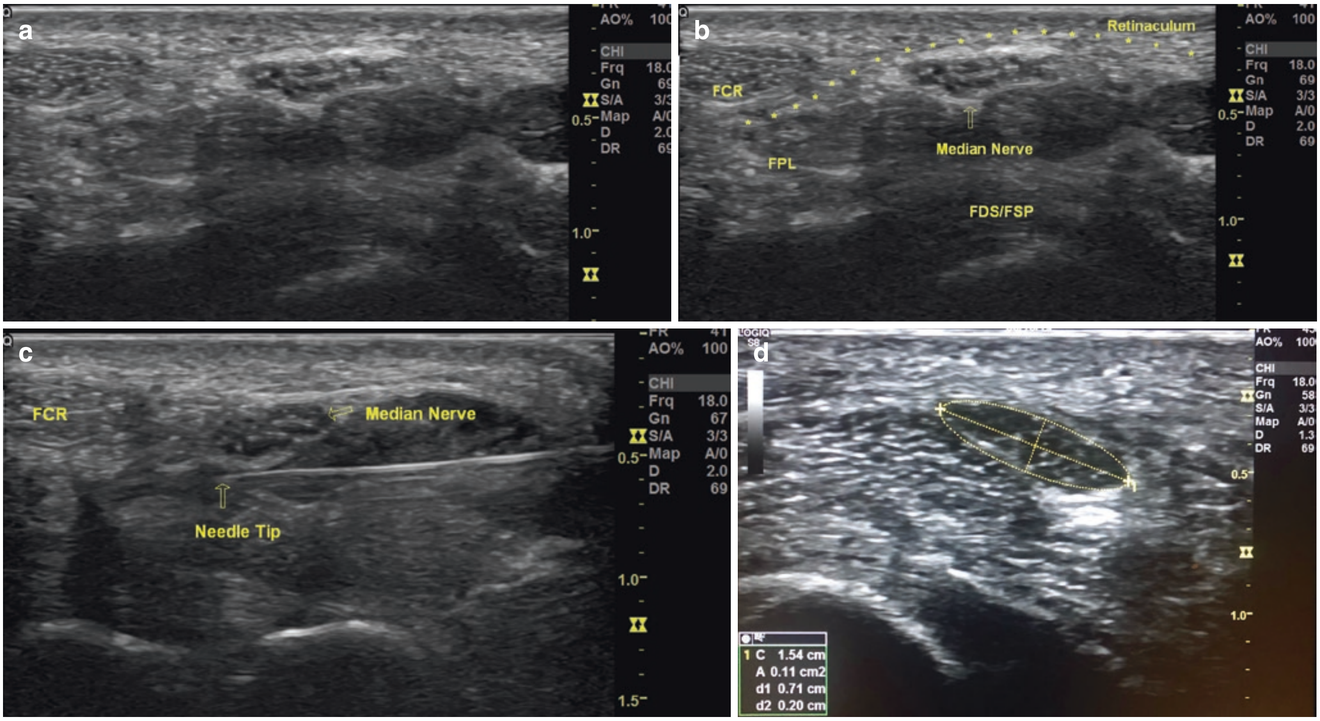

Fig. 29.3 (**a**) Axial view of the carpal tunnel. (**b**) Axial view of the carpal tunnel with structures labeled. Structures on the radial side is FCR and FPL. *FCR* flexor carpi radialis, *FPL* flexor pollicis longus, *FDS/FDP* flexor digitorum superficialis tendons and flexor digitorum profundus tendons, *stars* flexor retinaculum, *arrow* median nerve. (**c**) Axial view of the carpal tunnel with in-plane needle placement. *Arrow* identifies the needle tip. (**d**) Example of measuring cross-sectional area of the median nerve

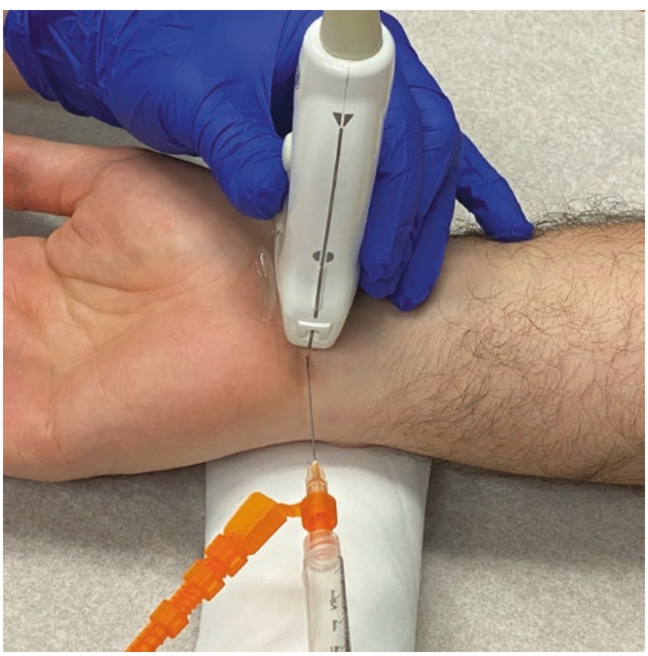

Fig. 29.4 Example of probe in short-axis position with in-plane approach

Fig. 29.5 Example of probe in short-axis position with out-of-plane approach

Complications

The palmar cutaneous branch of the ulnar nerve is superficial to the flexor retinaculum and is at risk of injury with the in-plane ulnar approach. Use color Doppler to identify vasculature in case of anatomical variants. The patient may experience hand numbness or weakness and should be advised not to drive.

Practical Tips

- Place a towel roll under the wrist to assist in slight wrist extension.
- Tilt the transducer to correct for anisotropy. The median nerve has less anisotropy than the tendons. Flex and extend the fingers to identify tendons and clearly visualize the nerve.
- Use color Doppler to identify vasculature.
- Oblique standoff technique is useful for small wrists.

Literature Review

The ulnar approach is preferred because a “safe zone” exists between the ulnar neurovascular bundle and the median nerve; however, a study investigating arteriole presence within the “safe zone” found that 38.9% of wrists had arterioles deep to the flexor retinaculum and the majority of deep arterioles were in close proximity to the median nerve, supporting the use of Doppler to identify vasculature. Median nerve CSA proximal and distal to the carpal tunnel, difference between cross-sectional areas, bowing of the retinaculum at the outlet, and outlet hypervascularity have been shown to have clinical utility in diagnosing CTS. A recent meta-analysis pooled median CSA values and determined that CSA correlated with severity in accordance with electrodiagnostic classification of CTS: mean CSA 11.64 mm for mild, 13.74 for moderate, and 16.80 for severe CTS.

Ganglion Cyst

General

Ganglion cysts are benign, soft tissue masses often found on the dorsal or volar surfaces of the wrist and hand. They are filled with mucoid material encapsulated in collagenous sheets without a synovial lining and communicate with a nearby joint via a stalk.

The exact mechanisms of ganglion cyst formation are unknown; however, it has been suggested that the cystic fluid may arise from within the joint itself due to joint motion and stress or from joint stress leading to mucinous degeneration of adjacent extra-articular soft tissues. The majority of ganglion cysts occur in the dorsal wrist, followed by the volar surface. Ganglia can also arise from tendons or tendon sheaths.

Diagnosis is largely based on clinical examination and symptoms. Ganglia of the wrist are typically 1–2 cm rubbery, transilluminating structures that are well attached to an underlying joint or tendon sheath. Many times, ganglia appear as a painless mass. However, if they are compressing on or irritating neighboring structures, they may become symptomatic. For example, patients may complain of aching in the wrist or hand, radiation of pain proximally through the arm, paresthesias from nerve compression, pain with activity or palpation of the mass, impaired grip strength, and decreased range of motion of the wrist and hand joint.

Indications

If a patient has failed conservative treatment options including observation and immobilization and symptoms are interfering with function, aspiration and/or injection of the ganglion cyst may be appropriate.

Functional Anatomy

On ultrasound, a ganglion cyst appears as a well-defined, anechoic or hypoechoic, fluid-filled mass, oftentimes connected to an adjacent joint or ligament via a communicating pedicle.

Sixty to seventy percent of ganglia are located on the dorsal wrist. Most commonly, ganglia are associated with the dorsal scapholunate ligament and joint. If present, it can impinge on the terminal branches of the posterior interosseous nerve in the fourth dorsal compartment.

About 20% of ganglion cysts occur on the volar aspect of the wrist. They usually are located in close proximity to the radial artery. On the palmar surface, ganglia frequently arise over the radiocarpal or scaphotrapezial joint. If found within the carpal tunnel or Guyon’s canal, ganglia can cause a compression neuropathy of the median or ulnar nerves, respectively.

Technique

Position Patient seated with arm resting on the table. The forearm supinated for volar ganglion cyst, pronated for dorsal ganglion cyst. A towel roll can be placed under the wrist to assist in flexion or extension if needed.

Equipment High-frequency linear array transducer.

- 25G needle with 1–3 mL local anesthetic
- 16–18G 1.5-inch needle attached to a 3 cc syringe for aspiration
- 0.5 mL corticosteroid and local anesthetic solution in separate syringe.

Scan Visualize the ganglion cyst in both the long-axis view and short-axis view to assess position and depth. To assess the dorsal wrist, place the probe longitudinally over the distal radius and scan distally until the scaphoid is visualized, and then rotate the probe to axial position and visualize the scapholunate joint. To assess the volar wrist, place the probe longitudinally over the distal radius, and scan distally until the radiocarpal joint is visualized. Use color Doppler to visualize nearby vasculature, including the radial artery which is in close proximity to the radiocarpal joint.

In-Plane Longitudinal Approach Using the 25G needle, inject a wheel of local anesthetic at the skin entry location. Position transducer in the longitudinal axis with the hypoechoic cyst centered in the screen (Fig. 29.6). Using the in-plane approach, advance the 16–18G needle attached to a 1 cc or 3 cc syringe until the needle tip is within the cyst. Aspirate cyst contents. You will see the cyst collapse around the needle tip. With the needle stabilized and maintained in position within the cyst, change the syringe, and administer corticosteroid injectate under direct visualization.

Complications

Visualize vasculature using color Doppler. Vascular aneurysms can present as a painful lesion similar in appearance to a cyst on physical exam, and radiocarpal cysts can be located in close proximity to the radial neurovascular bundle. Volar radiocarpal cysts have a 59–66% recurrence rate at 9 months after aspiration.

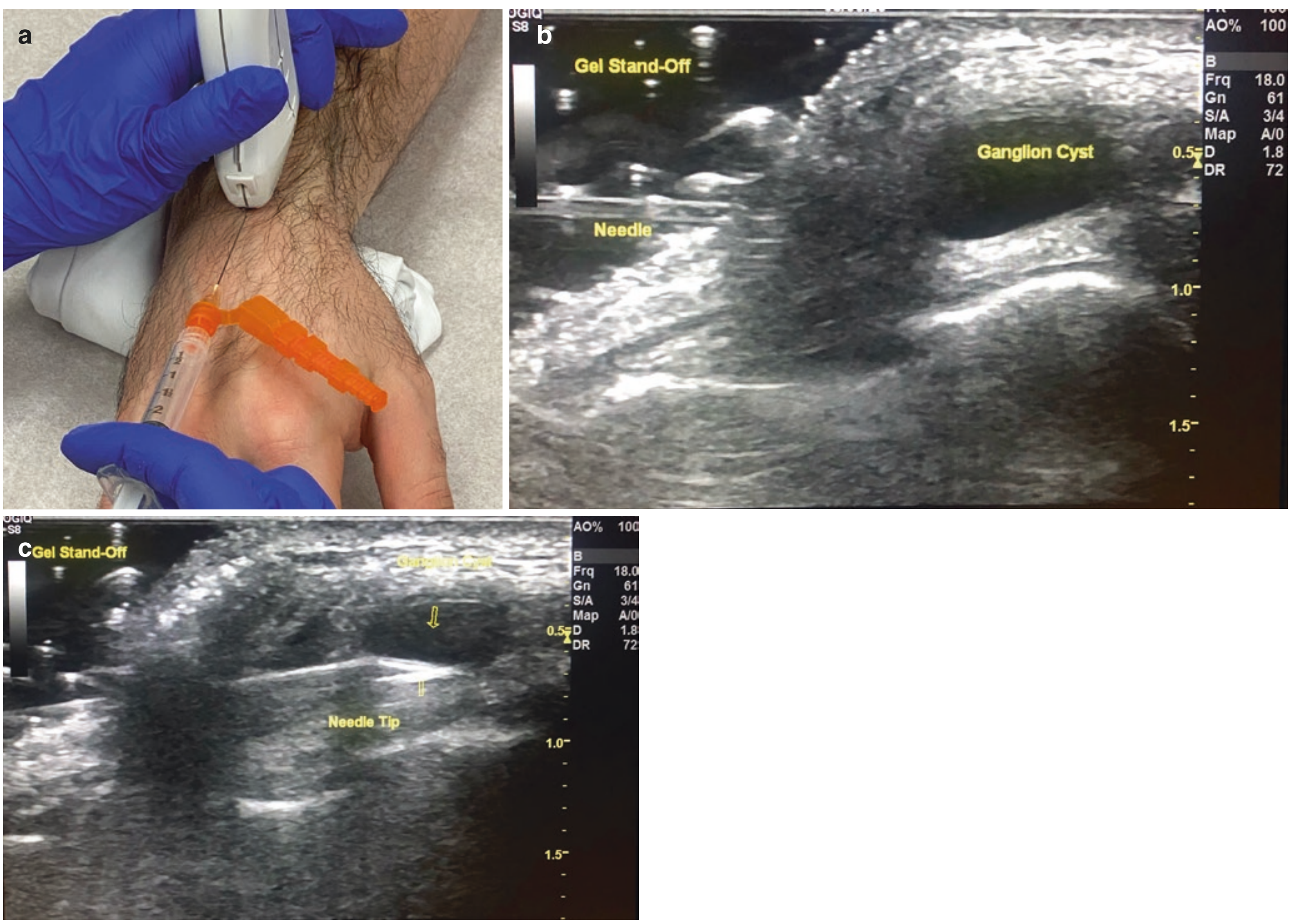

Fig. 29.6 (**a**) probe placement in longitudinal position with in-plane approach and gel standoff technique. (**b**) and (**c**) ultrasound images with the needle entering the skin and the needle inside the ganglion cyst. Arrows, needle tip and cyst

Practical Tips

- Place a towel roll under the wrist to assist in flexion/extension to open the carpal joints for better visualization.
- Use color Doppler to visualize nearby vasculature, including the radial artery.
- Use oblique gel standoff technique for small wrists or superficial cysts.

Literature Review

Variable success and recurrence rates have been observed for aspiration of ganglion cysts. Studies have investigated aspiration with injection of corticosteroid, using hyaluronidase in conjunction with a steroid, and aspiration with splinting. Surgical excision has demonstrated significantly lower recurrence rates in comparison to aspiration; however, it may be associated with an increased risk of complications, such as wound infections or damage to surrounding anatomical structures, and a prolonged recovery. Although limited studies exist investigating the benefit and techniques of ultrasound-guided aspiration of ganglion cysts, due to the ease of the procedure, aspiration with or without injectate still remains a widely used and acceptable treatment option.

Trigger Finger

General

Trigger finger (stenosing tenosynovitis) is caused by tenosynovitis of the flexor digitorum profundus (FDP) and flexor digitorum superficialis (FDS) tendons as they cross the metacarpal phalangeal (MCP) joint at the A1 pulley. Thickening of the A1 pulley due to chronic friction causes secondary flexor tendon inflammation, and the flexor tendons get mechanically stuck proximal to the annular tendon, locking the affected finger into flexion. Diagnosis is based on history and physical exam, which includes pain located over the volar MCP joint that can radiate down the affected digit or proximally into the palm, a palpable mass, a tightness of the flexor tendon, and the digit becoming locked in flexion or a sensation of catching when extending the digit from a flexed position. Diagnosis can be reinforced by visualization of hypoechoic thickening of the A1 pulley and a nodule on the flexor tendon. Have the patient flex, and extend the finger and observe for any dynamic abnormalities or catching as the flexor tendons slide under the A1 pulley. Trigger finger is more common in women and associated with diabetes and rheumatoid arthritis.

Indications

If a patient has failed conservative treatment options (observation, immobilization with a ring splint for 6–12 weeks, and NSAIDs) and symptoms are interfering with function, injection of the tendon sheath may be appropriate.

Functional Anatomy

The flexor pulley system is made of canals formed by retinacular sheaths on the volar surface of the fingers through which the FDP and FDS flexor tendons pass through. The system comprises five annular pulleys and three cruciform pulleys (Fig. 29.7). The FDP inserts on the base of the distal

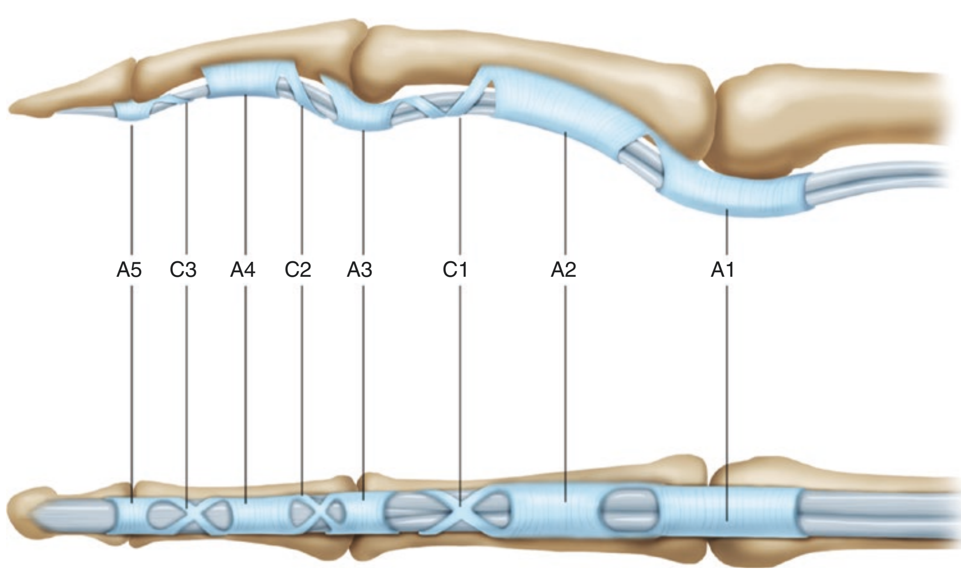

Fig. 29.7 Flexor tendon of the finger and the annular (A1–5) and cruciform (C1–3) pulleys Reprinted with permission from Philip Peng Educational Series

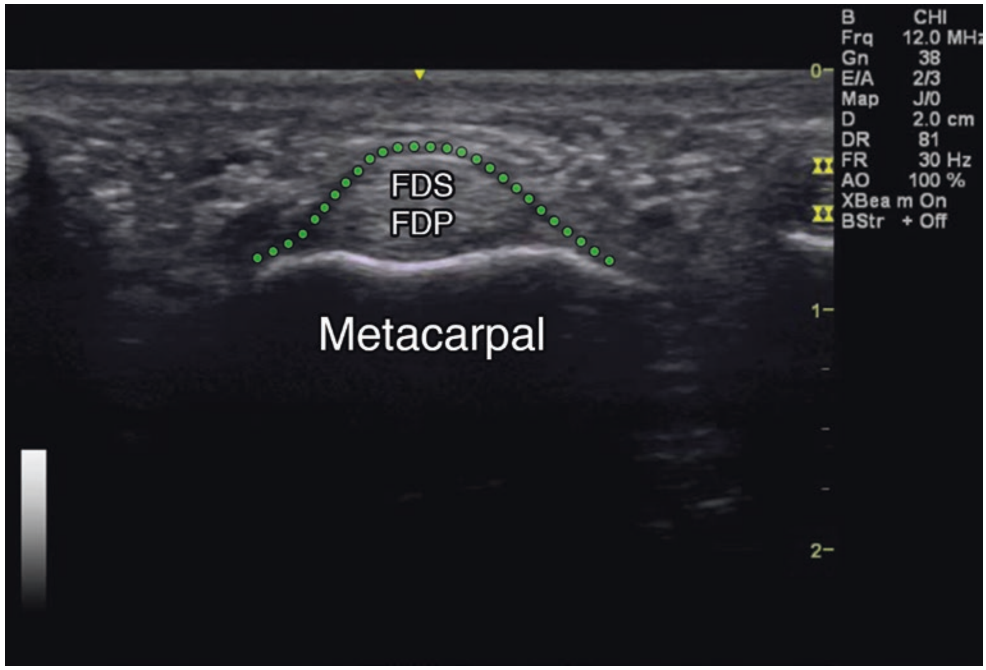

Fig. 29.8 Axial view of FDS and FDP overlying the metacarpal. *Green dotted* line represents the tendon sheath forming the A1 pulley

phalanx and flexes the distal interphalangeal joint (DIP). The FDS inserts on the body of the middle phalanx and flexes the proximal interphalangeal joint (PIP) and MCP. The A1 pulley overlies the volar surface of the MCP joint and is the most commonly affected pulley. Digital arteries and nerves run along the medial and lateral side of each phalanx.

Technique

Position Patient seated with arm resting on the table, the hand palm up.

Equipment High-frequency linear array transducer (10 Hz) or hockey stick probe.

- 25G needle with 1 mL local anesthetic
- 0.5 mL corticosteroid.

Scan Place the probe in a long-axis position over the affected MCP joint, and visualize the A1 pulley as it crosses superficial and proximal to the joint. The tendons of the flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP) can be seen overlying the phalanx. Rotate the probe into a short-axis position over the MCP joint. View the annular pulley as a thin hypoechoic line overlying the FDS and FDP, from superficial to deep (Fig. 29.8). Use color Doppler to identify digital arteries on either side of the phalanx.

Out-of-Plane Sagittal Approach: Center the probe over the MCP joint in short-axis view. Identify the A1 pulley overlying the FDS, FDP, and metacarpal, from superficial to deep. Using out-of-plane approach with a steep angle, insert the needle, and aim for the center of the probe (Fig. 29.9). When the needle tip, identified as a hyperechoic dot, is in the tendon sheath, administer the injectate. Do not inject directly into the tendon.

In-Plane Longitudinal Approach Center the probe over the MCP joint in a long-axis view. Using the in-plane approach, advance the needle parallel to the probe at a very shallow angle (Fig. 29.10). When the needle tip enters the superficial aspect of the tendon sheath, administer the injectate, and verify placement by observing distention of the sheath.

Complications

Fat necrosis, skin depigmentation, and tendon rupture can occur as a result of corticosteroid injection.

Practical Tips

- For small anatomy or if the high-frequency linear array transducer is too large, use the hockey stick probe and gel standoff technique for easier access and needle visualization.
- Use color Doppler to visualize nearby digital arteries.

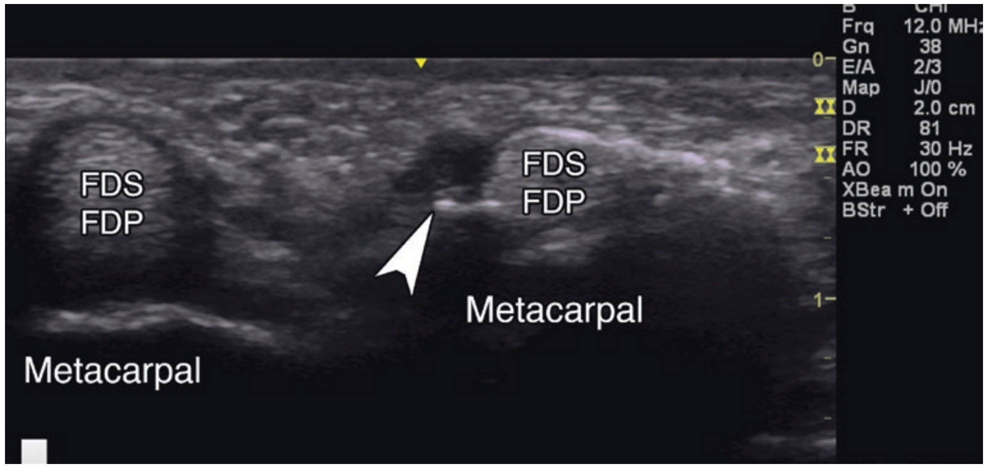

Fig. 29.9 Axial view of the A1 pulley with needle in out-of-plane approach. *Arrowhead* points to the needle

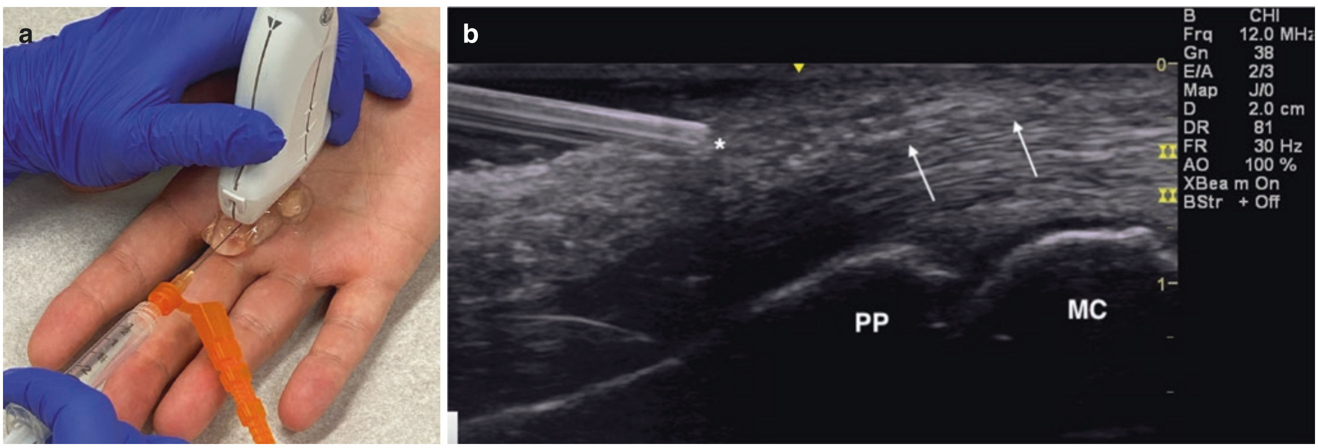

Fig. 29.10 (**a**) longitudinal probe placement over the MCP joint with in-plane gel standoff injection technique. (**b**) ultrasound image of a long-axis view of the flexor tendon over the MCP joint with in-plane needle approach. *Arrows* point to tendon sheath. *Star* identifies the needle tip. *MC* is the metacarpal and *PP* is the proximal phalanx

- Flex and extend the affected digit to visualize the tendon; look for hypoechoic thickening and/or a nodule.
- If resistance is felt, pull needle back to avoid injecting into the tendon.

Literature Review

Steroid injections treat trigger finger symptoms by decreasing inflammation of the FDS and FDP tendons, therefore reducing friction as they slide under the thickened A1 pulley. NSAIDs have been injected to reduce inflammation in patients who cannot tolerate steroids; however, studies have shown that steroids are more effective with 70% of patients reporting complete resolution of symptoms compared to 53% of patients treated with NSAID injection. Ultrasound guidance for intra-sheath steroid injection confirms correct placement of injectate and minimizes risk of tendon injury or rupture. Postinjection ultrasound has been used to compare preinjection and postinjection thickness of the A1 pulley and flexor tendons, with significant improvement in tendon thickness, VAS score, and Quinnell grading at 3 weeks postinjection, confirming the therapeutic effects of the steroid injection.

Dequervain's Tenosynovitis

General

De Quervain's tenosynovitis is a painful inflammation of the first dorsal extensor compartment of the wrist (Fig. 29.11), consisting of the abductor pollicis longus (APL) and extensor pollicis brevis (EPB). It is the most common tendinopathy of the wrist and hand. It most often occurs in middle-aged women and in occupations or athletes that require repetitive wrist bending or twisting. Patients present with a point of exquisite tenderness over the radial styloid process and the involved tendons. Typically, patients experience symptoms

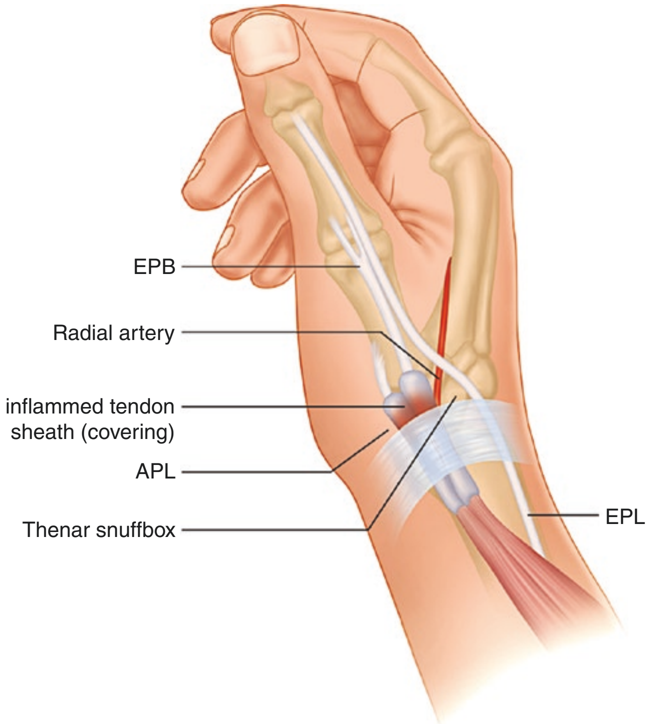

Fig. 29.11 Tenosynovitis of the first dorsal extensor compartment. EPB, extensor pollicis brevis, APL, abductor pollicis longus, EPL, extensor pollicis longus

Fig. 29.12 Finkelstein's test

in their dominant wrist, usually from overuse rather than a direct trauma.

Finkelstein's test is a special maneuver to assist in diagnosing de Quervain's tenosynovitis (Fig. 29.12). Reproduction of symptoms occurs by flexing the thumb into the palm and applying an ulnar deviation to the wrist, stretching the two thumb tendons. X-rays are not routinely used as they are often unremarkable. Ultrasound can reveal swelling of the tendons or a thickened extensor retinaculum suggesting possible synovitis.

Indications

Patients with continued debilitating pain who have failed conservative treatment including splinting and NSAIDs may be candidates for ultrasound-guided injections. Stenosing tenosynovitis of the first dorsal compartment responds well to corticosteroid injections, with reported relief in up to 90% of patients.

Functional Anatomy

The first dorsal extensor compartment of the wrist consists of the APL and EPB and is located directly over the radial styloid process (Fig. 29.13). The APL originates on the posterior radius and ulna and inserts at the base of the first metacarpal. Its action includes abduction and extension of the thumb. The EPB originates on the posterior radius and inserts at the base of the proximal phalanx of the thumb. Its action is to extend the thumb, and it forms the radial border of the anatomical snuffbox. The APL lies more volar than the EPB. The compartment is surrounded by an extensor retinaculum.

Technique

Position Place the forearm resting comfortably on table surface in neutral position with radial styloid facing up.

Equipment High-frequency linear array transducer or hockey stick linear probe

- 25G 1.5 in needle with 1–3 mL local anesthetic
- 0.5 mL corticosteroid

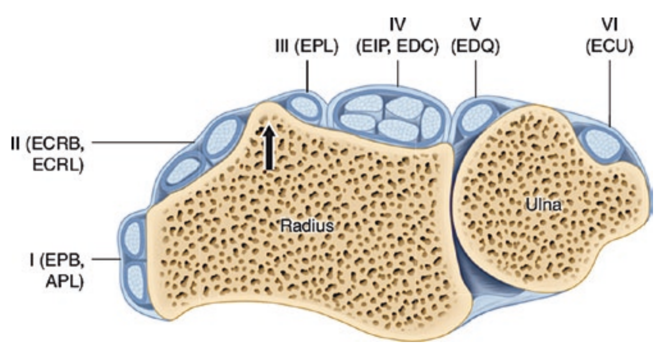

Fig. 29.13 Six compartments of the extensor tendons in the wrist. First compartment, abductor pollicis longus (APL) and extensor pollicis brevis (EPB); second compartment, extensor carpi radialis longus (ECRL) and extensor carpi radialis brevis (ECRB); third compartment, extensor pollicis longus (EPL); fourth compartment, extensor indicis proprius (EIP) and extensor digitorum (EDC); fifth compartment, extensor digiti quinti (EDQ); sixth compartment, extensor carpi ulnaris (ECU). Lister tubercle (arrow) separates the second from the third compartment

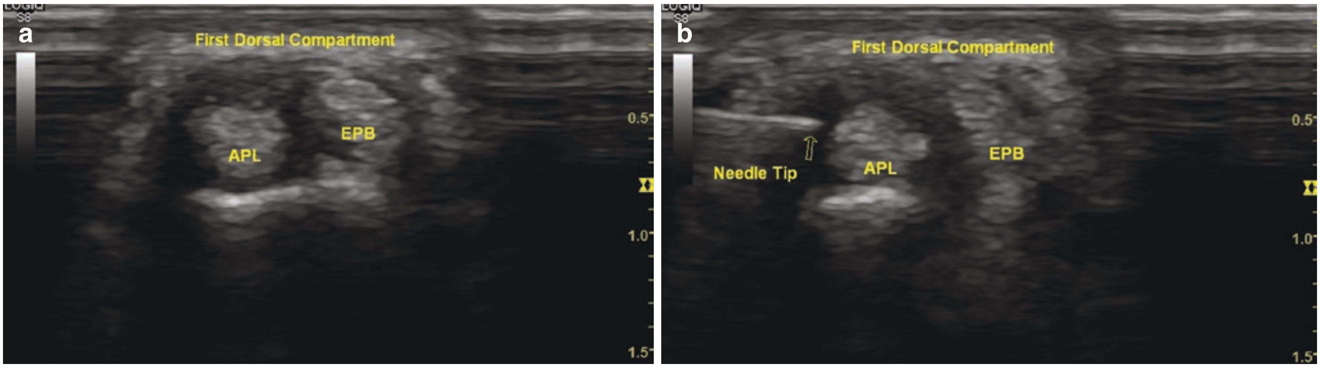

Fig. 29.14 (**a**) short-axis view of the first dorsal compartment with extensor retinaculum. *APL* abductor pollicis longus, *EPB* extensor pollicis brevis, and radius. (**b**) short-axis view of needle in plane and needle tip under the extensor retinaculum. *Arrow* identifies the needle tip

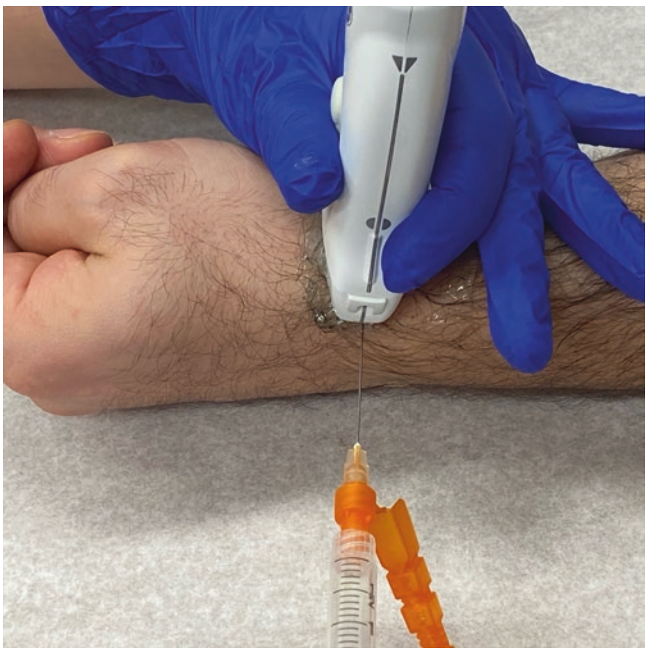

Fig. 29.15 Probe in short-axis position with in-plane approach

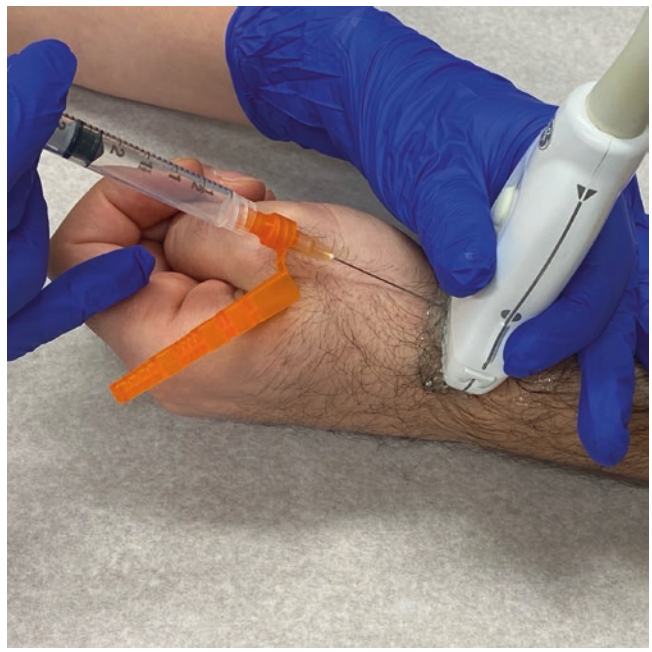

Fig. 29.16 Probe in short-axis position with out-of-plane approach (b)

Scan Place the probe in the short axis over the first extensor compartment at the level of the radial styloid (Fig. 29.14). Visualize the APL tendon volar to the EPB tendon with the superficial extensor retinaculum overlying the compartment. Deep to the APL and EPB is the radius. Identify and verify the location of the radial artery near the volar surface using color flow. Proximally the tendons will be side by side and will diverge distally. Tendon sheath thickening may be seen, and "donut sign" in short-axis view may indicate synovitis.

In-Plane Short-Axis Approach Place the probe in the short axis over the first extensor compartment at the level of the radial styloid. Advance the needle in plane to the transducer, from dorsal to volar, in a shallow trajectory until the needle tip is under the extensor retinaculum and above the APL and EPB tendons. Administer the injectate under direct visualization (Fig. 29.15).

Out-of-Plane Short-Axis Approach Place the probe in the short axis over the first extensor compartment at the level of the radial styloid as above. Advance the needle from distal to proximal out of plane with the needle entering the skin with a steep angle adjacent to and at the center of the transducer (Fig. 29.16). Observe the needle tip (hyperechoic dot) as it enters the extensor compartment and reaches the target under the extensor retinaculum and above the APL and EPB tendons. Administer the injectate under direct visualization.

Complications

When using corticosteroids, there is a risk of skin depigmentation. Injecting near tendons increases the risk of tendon rupture. The superficial branch of the radial nerve that lies over the extensor compartment is at risk of being blocked with resultant temporary hand numbness.

Practical Tips

- For small anatomy or if the high-frequency linear array transducer is too large, use the hockey stick probe and gel standoff technique for easier access and needle visualization
- Scan in the longitudinal view to visualize the APL and EPB in long axis. Thickening of the tendon sheath may suggest synovitis.
- Thoroughly scan the length of the tendons and their insertions. If a septum is noted, inject into both compartments to ensure adequate spread of injectate.
- Use color Doppler to visualize nearby vasculature, including the radial artery.

Literature Review

Ultrasound-guided injections have been shown to better and more precisely deliver corticosteroid in comparison to landmark-guided injections. US allows the practitioner to visualize the extensor retinaculum, the APL, and the EPB. It also allows for visualization of sub-compartmentalization of the first extensor compartment, an anatomical variant which requires a tailoring of injection technique. Ultimately, utilization of ultrasound permits for different injection techniques based on ultrasound findings of the first extensor compartment and has shown to be beneficial in the management of de Quervain's tenosynovitis.

CMC Joint

General

The first carpometacarpal (CMC) joint is a highly mobile, saddle joint. The joint space is formed between the trapezium and the first metacarpal bone (Fig. 29.17). The CMC joint allows for thumb movement in various planes and is a common site of arthritis and instability.

CMC joint pathology appears to be more frequent in females and is caused by repetitive stress. Patients with CMC joint pathology usually experience pain upon movement of the thumb as well as decreased range of motion and weakness. Grasping, pinching, or twisting motions typically elicit pain.

Two provocative tests which are useful when diagnosing CMC joint pathology are the grind test and the lever test (Fig. 29.18). For the grind test, axially load and rotate the CMC joint. For the lever test, hold the base of the metacarpal bone, and move the CMC joint in both radial and ulnar

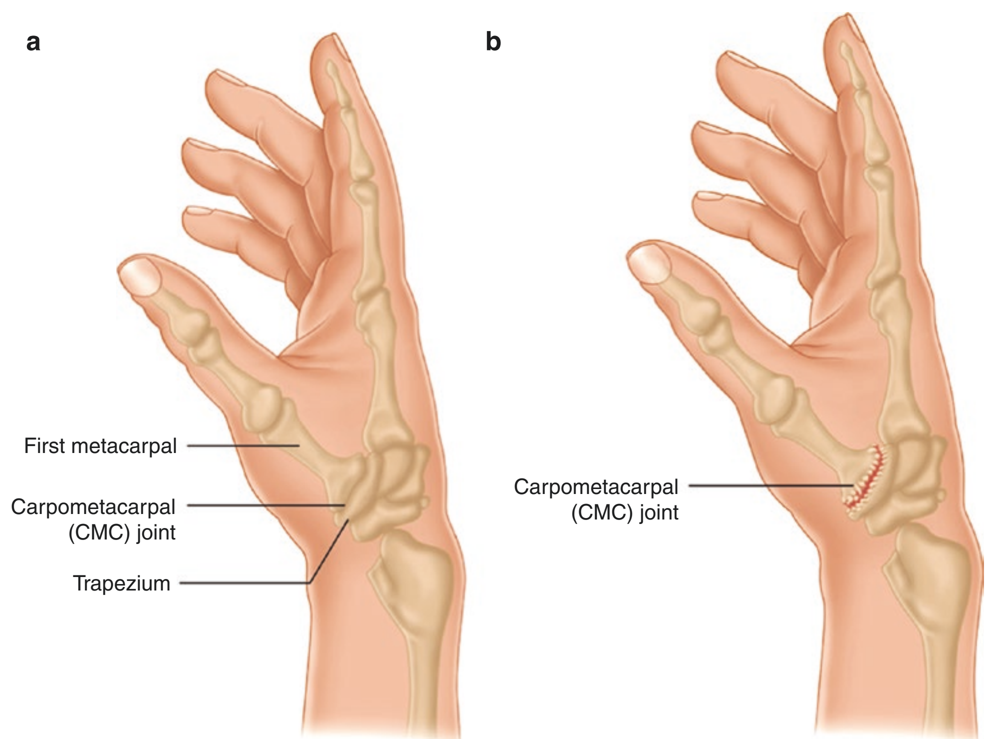

Fig. 29.17 Carpometacarpal joint, normal (**a**) and with arthritis (**b**)

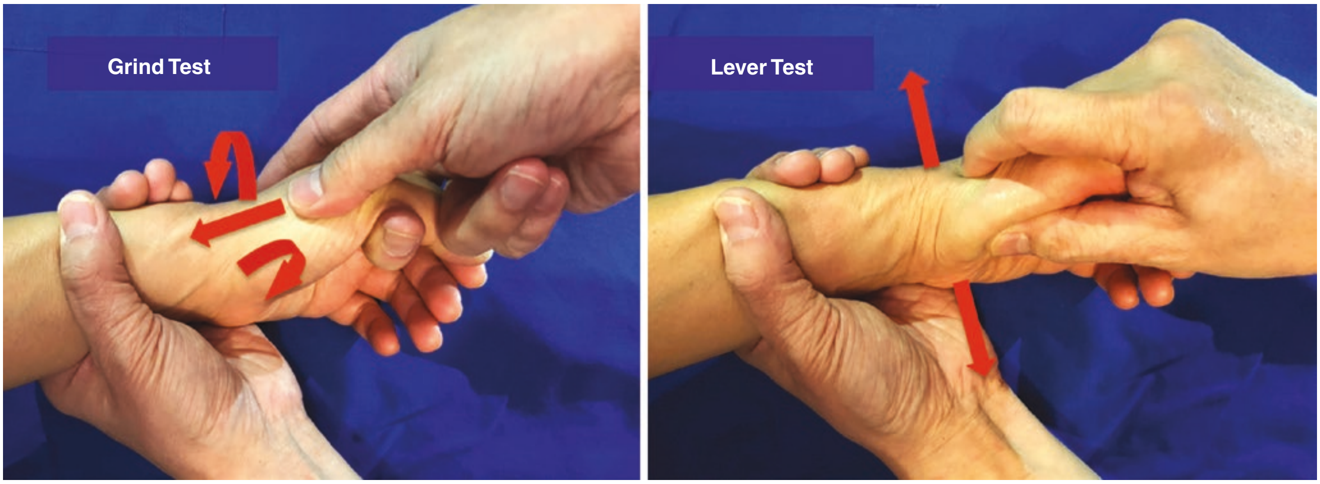

Fig. 29.18 Grind and level test

directions. These tests are positive if they reproduce pain or crepitus is appreciated.

Plain radiographs may demonstrate degenerative changes within the joint. Ultrasound evaluation can also show degenerative changes, such as joint space narrowing, synovitis, cortical irregularities, osteophytes, and effusions.

Indications

Patients who continue to experience pain that is refractory to conservative measures, such as a thumb spica, activity modification, nonsteroidal anti-inflammatory medications, and occupational therapy, may be appropriate for diagnostic or therapeutic injection to the CMC joint.

Functional Anatomy

The thumb is composed of the distal phalanges and the proximal phalanges, connecting to the first metacarpal bone. Attached to the first metacarpal bone is the trapezium, and this articulation forms the CMC joint. Movement through this joint allows for primary movements, including flexion, extension, adduction, and abduction, and more complex movements, including opposition, retropulsion, palmar abduction, radial abduction, and radial adduction.

Several important structures neighbor the CMC joint. The superficial radial nerve has terminal branches located on either side of the CMC joint. Also nearby are the superficial and deep palmar arteries, which branch off of the radial artery. They are found at the anatomic snuffbox, located just proximally to the CMC joint. Traversing the CMC joint are the abductor pollicis longus and extensor pollicis brevis tendons.

Technique

Position Place the forearm resting comfortably on a flat surface in neutral position with radial styloid facing up.

Equipment High-frequency linear array transducer or hockey stick linear probe.

- 25G 1.5 in needle with 1–3 mL local anesthetic
- 0.5 mL corticosteroid.

Scan Place the transducer in the longitudinal position over the CMC joint. Identify the first metacarpal distally, the base of the trapezium proximally, and the joint space (Fig. 29.19). The APL and EPB tendons are seen overlying the CMC joint.

Out-of-Plane Longitudinal Approach Place the transducer in the longitudinal position over the CMC joint. Note the first metacarpal and trapezium, and place the joint space in the center of view. With needle approaching from dorsal to volar and using a steep angle, enter the skin close to the center of the transducer, and advance toward the joint space (Fig. 29.20). When the needle tip is visualized as a hyperechoic dot in the joint space, administer the injectate under direct visualization, and confirm correct placement by observing capsular displacement.

In-Plane Longitudinal Gel Standoff Approach Place the transducer in the longitudinal position over the CMC joint as above. Identify the APL and EPB overlying the CMC joint, note the first metacarpal and trapezium, and place the joint space in the center of view. With the needle approaching from distal to proximal, visualize the needle within the gel, and enter the skin over the trapezium and advance into the

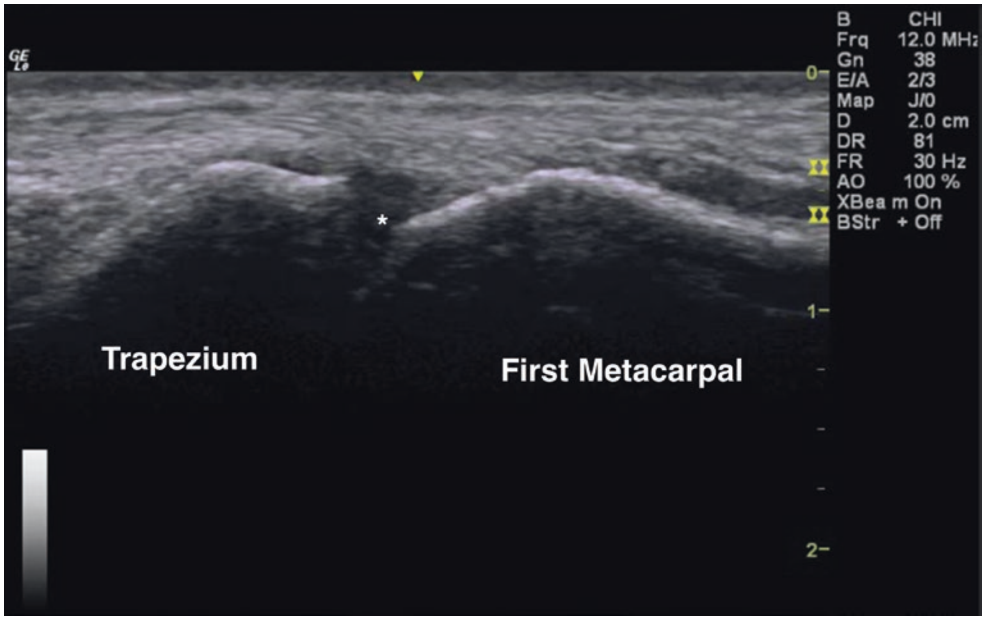

Fig. 29.19 Long-axis view of first CMC joint. *Asterisk* identifies the joint space. This is also the needle tip target for an out-of-plane approach

Fig. 29.20 Probe in longitudinal position over CMC joint with out-of-plane approach

joint (Fig. 29.21). Administer the injectate under direct visualization taking care not to pierce the overlying APL and EPB, and confirm correct placement by observing capsular displacement.

Complications

Avoid piercing the APL and EPB. Risks include bleeding, tendon rupture, infection, and skin depigmentation if corticosteroid is used.

Practical Tips

- Flex the thumb to open up the CMC joint.
- Avoid injecting into the tendons.
- Use the in-plane or oblique gel standoff technique for small anatomy.

Literature Review

Ultrasound guidance, when performed by an experienced user, has been found to improve the accuracy for thumb CMC injections, by assisting with correct needle placement in cases of severe joint space narrowing and osteoarthritis.

Intra-articular CMC joint injections are usually performed with corticosteroids and provide short-term relief. Alternative injectates, such as hyaluronate or nonsteroidal anti-inflammatories, can be considered alone or in combination for CMC joint osteoarthritis. PRP injections have also been postulated to offer longer relief of symptoms.

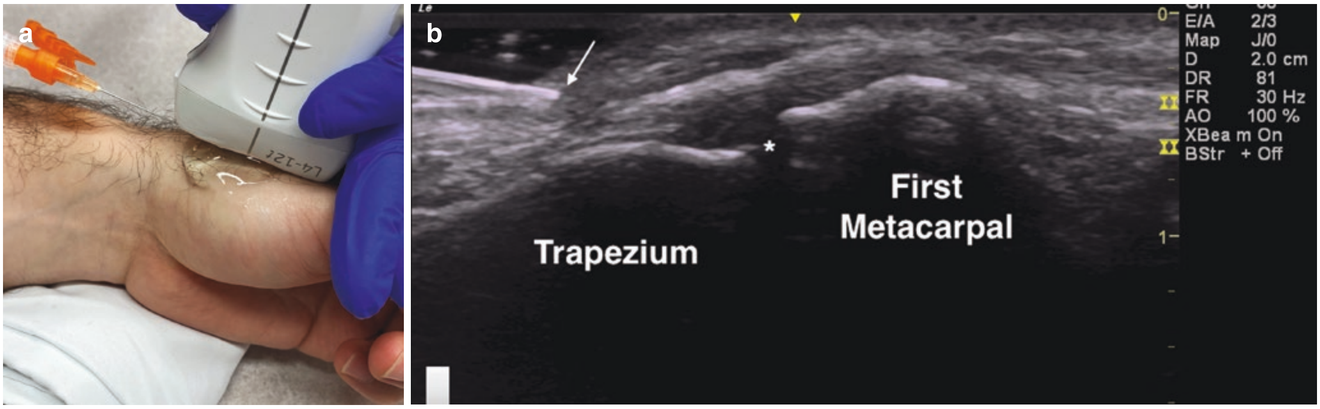

Fig. 29.21 (**a**) probe in longitudinal position over CMC joint with in-plane gel standoff approach. (**b**) ultrasound image of long-axis view of the first CMC joint with in-plane approach using gel standoff technique. *Asterisk* identifies the joint space. *Arrow* shows the needle tip

Suggested Reading

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