The metacarpophalangeal joints of the fingers are complex condylar hinge joints capable of multiplanar motion.1-3 The joint surfaces and surrounding capsule and ligaments provide static stability whereas the intrinsic and extrinsic muscles are dynamic stabilizers. The normal joint flexes approximately 90° and may extend as much as 20°-30°. Abduction and adduction of up to 10°-40°, depending on the specific finger, is greatest in full extension and increasingly constrained throughout flexion.

Some rotation and deviation also occur during flexion and with pinching and grasping motions.

**ANATOMY**

The convex metacarpal head is elliptically shaped and has a correspondingly variable radius of curvature in the mid-sagittal plane, whereas the base of the proximal phalanx has a shallow circular plane that conforms to the various segments of the articular surface with which it articulates. The geometric multiaxial center of rotation of the metacarpophalangeal joints lies on a spiraling arc that becomes increasingly palmar as flexion increases within the approximate center of the metacarpal head.1 The glenoid cavity of the base of the proximal phalanx is oblong and its greatest diameter is in the transverse plane perpendicular to the long anteroposterior diameter of the metacarpal head. The glenoid cavity of the proximal phalanx covers most of the metacarpal head articular surface in the transverse plane, but only approximately one-third of its facade in the sagittal plane at any point during flexion and extension. The volar plate elongates the glenoid cavity and constrains it throughout extension.

The collateral and accessory collateral ligaments provide lateral stability and guide the metacarpophalangeal joint throughout its range of flexion and extension.1-3 The collateral ligaments originate dorsally from the radial and ulnar tuberosities of the metacarpal head and course distally and obliquely to insert on the radial and ulnar tuberosities on the palmar proximal margins of the base of the proximal phalanx. The radial collateral ligament originates and attaches slightly closer to the joint margin and courses less vertically than its ulnar counterpart. The accessory collateral ligaments originate just palmar to the bone and course distally and obliquely to insert on the radial and ulnar tuberosities on the palmar proximal margins of the base of the proximal phalanx. The radial collateral ligament originates and attaches slightly closer to the joint margin and courses less vertically than its ulnar counterpart. The accessory collateral ligaments originate just palmar to the bone and course distally and obliquely to insert on the radial and ulnar tuberosities on the palmar proximal margins of the base of the proximal phalanx.
of the joint and become progressively longer and taut throughout flexion and shorten and relax during extension. The accessory collateral ligaments are positioned palmar to the flexion-extension axis of the joint and are tense and longer in extension and relax and shorten during flexion.

COLLATERAL LIGAMENT INJURIES

Clinical stress testing to determine stability of the collateral ligaments of the undisplaced finger is performed with the metacarpophalangeal joint fully flexed, a position in which the normal collateral ligament is fully stretched and lateral deviation of the base of the proximal phalanx is prevented. Lateral stress testing of the metacarpophalangeal joint in full extension tests the integrity of the accessory collateral ligaments. Local anesthesia may be necessary to perform this maneuver. Stress radiographs may be performed in various positions of flexion and extension and may reveal instability directly or by comparison with similar views of the same finger of the uninvolved opposite hand.

Injuries that stretch or partially tear one of the collateral ligaments may be accompanied by localized pain, swelling, ecchymosis, and tenderness, but the ligaments remain aligned and stable. The joint and finger alignment remains normal on clinical and radiographic examination and during lateral stress testing. An undisplaced or minimally displaced avulsed bone fragment may be seen on radiographs in some cases and alerts the examining physician to the lesion. Metacarpophalangeal and finger motion may be compromised initially, but recovery usually is complete within a few weeks following protective splinting and progressive rehabilitation.

Complete collateral ligament tears have similar signs and symptoms, but are unstable, and the finger may deviate away from the side of the tear securing the diagnosis. A displaced avulsed bone fragment may act as a sentinel to the lesion. Brewerton radiographic views of the metacarpal head may be helpful in identifying displaced avulsion fractures. Clinical stress testing, stress radiographs, arthrography, and magnetic resonance imaging have been successful in diagnosing occult undisplaced lesions.

Although thumb metacarpophalangeal joint collateral ligament injuries are seen collectively only two-thirds as frequently as hand injuries, Radial and ulnar collateral ligament injuries are evenly distributed in the middle finger, the most frequently involved finger, whereas ulnar collateral tears are more common in the index finger and radial disruptions are more frequent in the ring and small fingers.

The collateral ligament may tear from its origin, insertion, or within its substance. Tears at the insertion occur most commonly and tears from the origin are least common. The accessory collateral ligament may be involved in more severe cases. Dorsal interosseous tendon avulsions may occur. An accompanying overlying transverse or oblique tear of the sagittal bands of the extensor hood usually is present. One side of the sagittal band tear may become interposed between the two ends of the torn collateral ligaments, similar to the Stener lesion seen in some complete tears of the ulnar collateral ligament of the metacarpophalangeal thumb joint.

Case Report

A 38-year-old woman sustained...
skeletal polytrauma in a motor vehicle accident. The left middle finger was jammed on impact, and pain and swelling of the left hand and ulnar deviation of the left middle finger at the metacarpophalangeal joint were noted on presentation. Radiographs demonstrated ulnar subluxation and translation of the proximal phalanx on the metacarpal head (Figure 1). Although manipulation restored the joint alignment, the reduction was not stable.

Surgery was performed within a few days of the injury. The lesion was approached through a dorsoradial incision over the metacarpophalangeal joint. The radial sagittal bands were torn. Palmar to the sagittal band, complete avulsion of the radial collateral and accessory collateral ligament conjoined origins from the metacarpal head was noted as well as some adjacent capsular tearing (Figure 2). No Stener-type lesion was noted. The second dorsal interosseous tendon was intact.

A mini bone anchor was inserted in the radial surface of the metacarpal head at the perceived center of the radial collateral ligament origin. The metacarpophalangeal joint was reduced, and the torn radial collateral ligament origin was secured to the bone anchor suture (Figure 3). Joint alignment, stability, and full passive range of motion were restored. The adjacent capsule and overlying sagittal band tears were repaired in layers with fine resorbable sutures.

The metacarpophalangeal joint was splinted in 30° of flexion for 3 weeks and interphalangeal joint motion was encouraged. The index and middle fingers were buddy-taped to protect the repair while allowing further recovery of digital motion. Strengthening using a soft, spongy ball was initiated 2 months postinjury. The patient recovered uneventfully.

**DISCUSSION**

Complete metacarpophalangeal collateral ligament tears may be apparent owing to deviation of the finger to the side opposite the tear on clinical examination and radiographs. Radiographic evaluation may also disclose joint subluxation. Early diagnosis and repair of complete finger metacarpophalangeal collateral ligament tear usually lead to good to excellent recovery within 12 weeks, provided no problems or complications occur.5,11,12 Complete collateral ligament tears are more likely to heal uneventfully if repaired initially.5,11,12 One side of the torn sagittal band may interpose under the torn ligament, creating a situation analogous...
to the Stener lesion sometimes observed in ulnar collateral ligament tears of the metacarpophalangeal thumb joint. It is important to restore the collateral ligament in these instances. Bone anchor sutures have been effective in achieving ligament repair at the origin or insertion of the ligament. Substance tears are repaired by direct suture. The re-establishment of radial collateral ligament stability is particularly important for the metacarpophalangeal joint of the index finger, owing to the considerable forces placed on this joint during pinch, grasp, and with the use of tools.

Intra-articular bone fragments are removed. Small avulsed bone fragments may be resected from the ligament. The ligament is then anchored as outlined above. Larger avulsion fragments are repaired with wires or mini screws to restore the ligament. Associated interosseous tendon avulsions should also be repaired by direct or bone anchor suture.

Failure to initially repair a completely torn metacarpophalangeal joint ligament may result in chronic pain, instability, deformity, weakness, and arthritis. Late ligament repair or reconstruction, although not as reliable as early repair, usually provides substantial improvement, if not full recovery, provided no arthritis exists.

Repair of the torn sagittal bands, accomplished by direct suture, is also important. Failure to repair a sagittal band tear may result in loss of centralization of the extrinsic extensor tendons of the metacarpophalangeal joint, resulting in chronic pain, swelling, extensor lag, finger deviation, snapping at the metacarpophalangeal joint, and ultimately, arthritis. Reconstruction may also be necessary for the residuals of this lesion alone, if left unattended.

REFERENCES