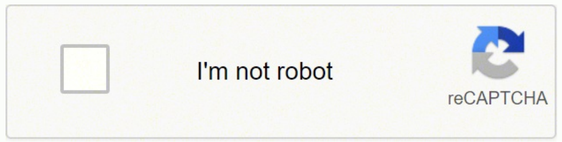

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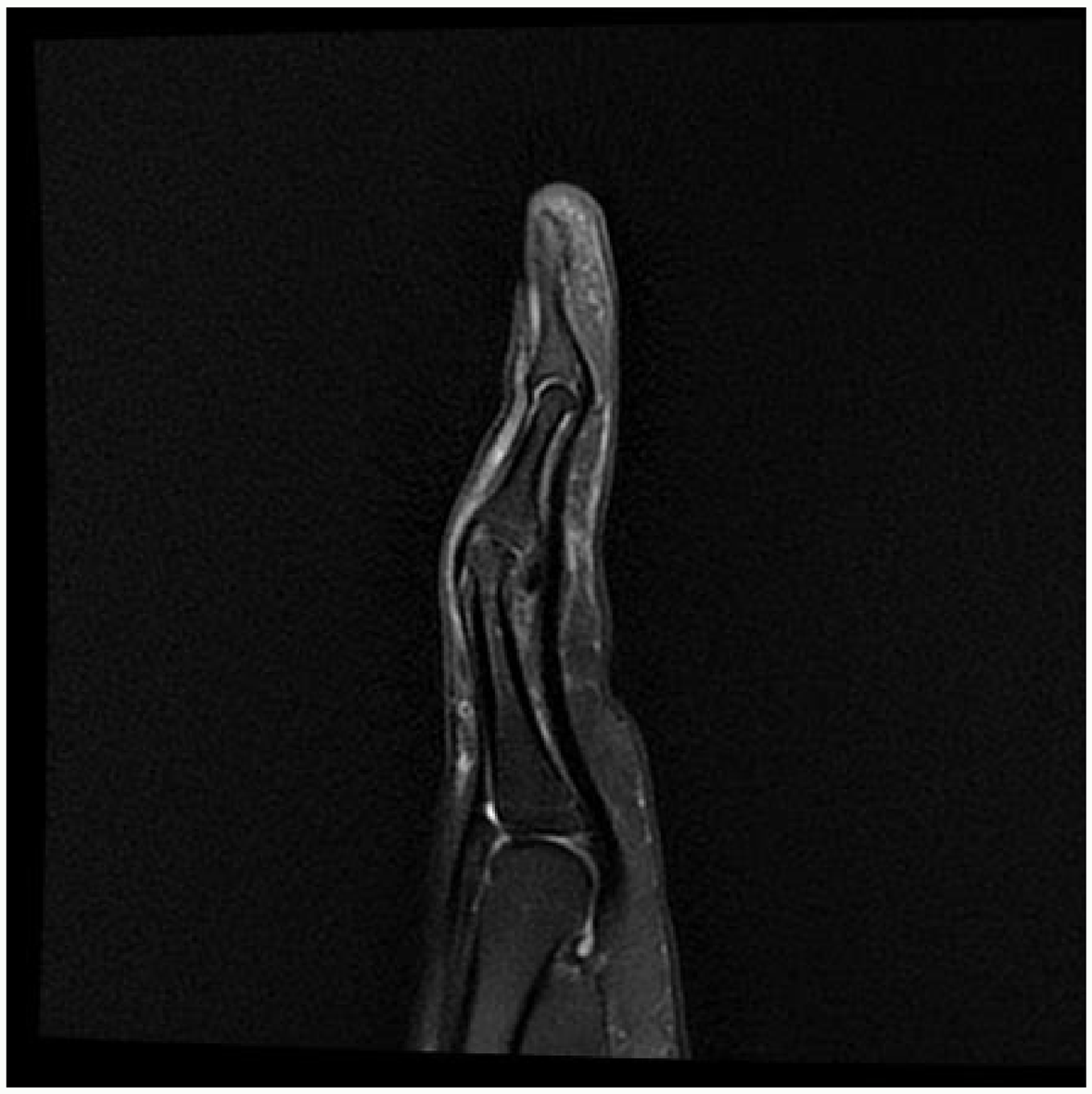
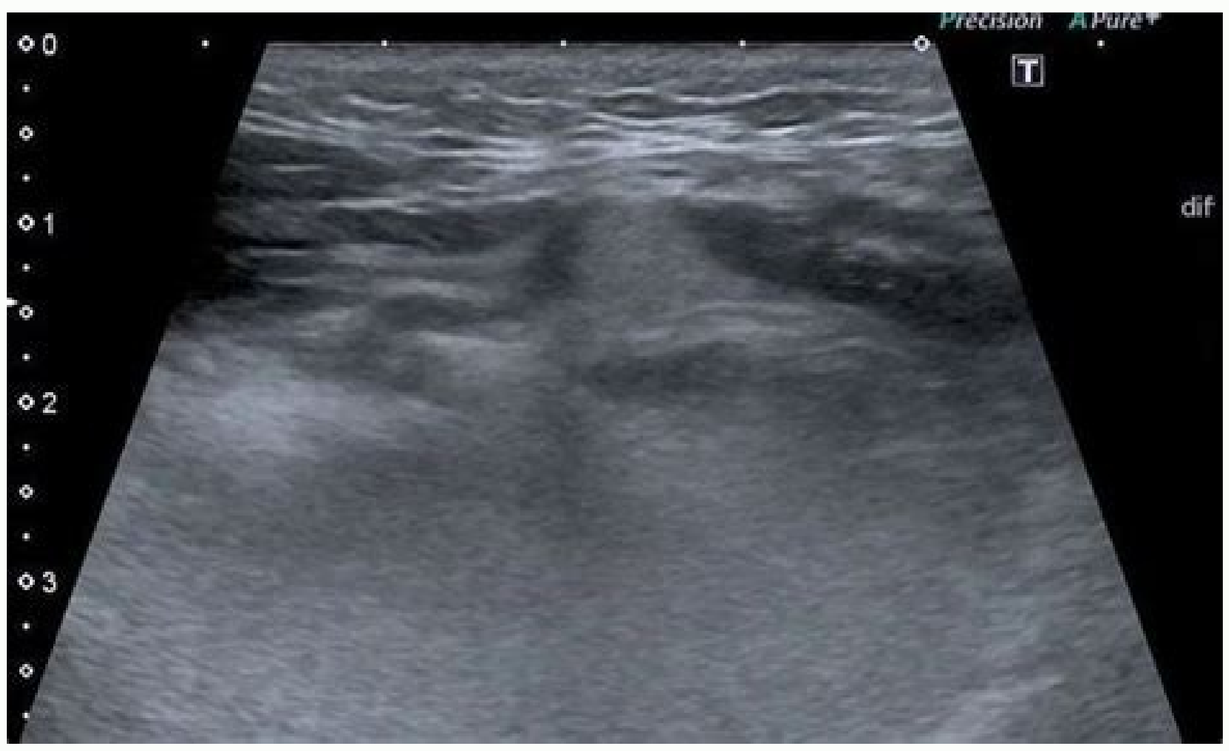
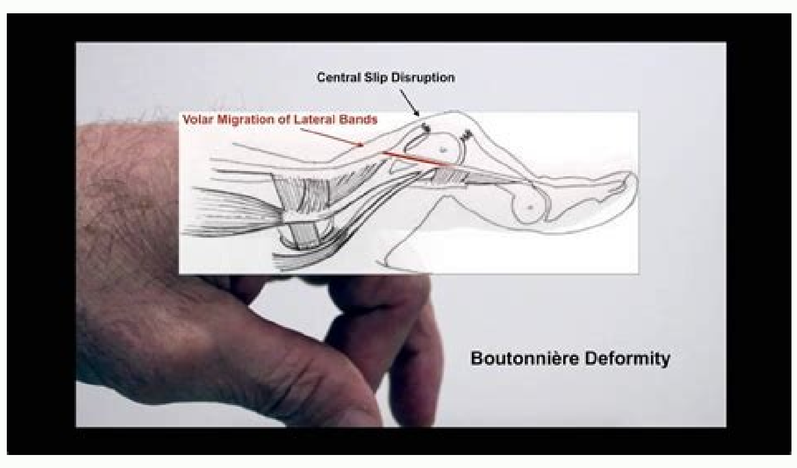
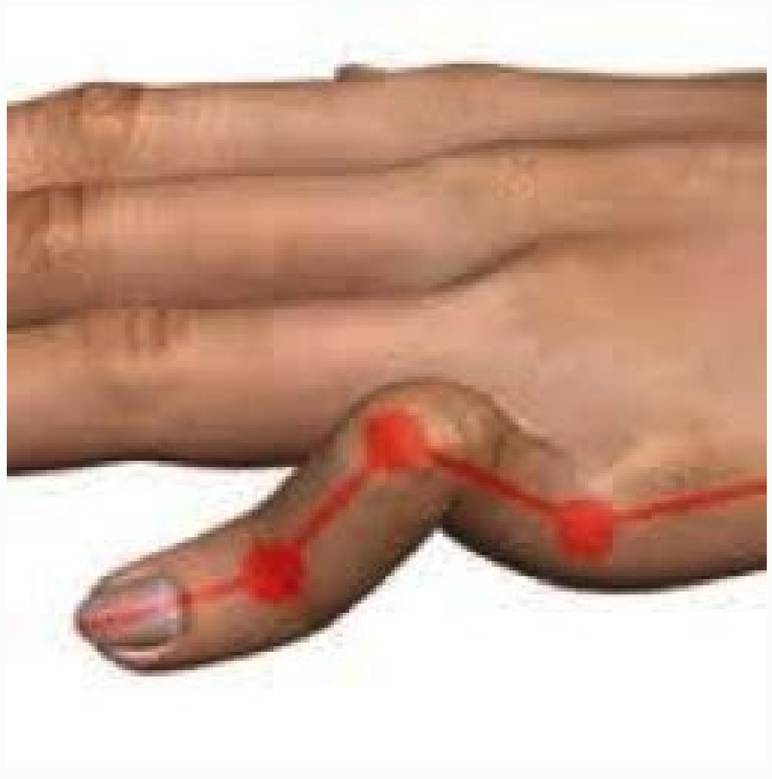
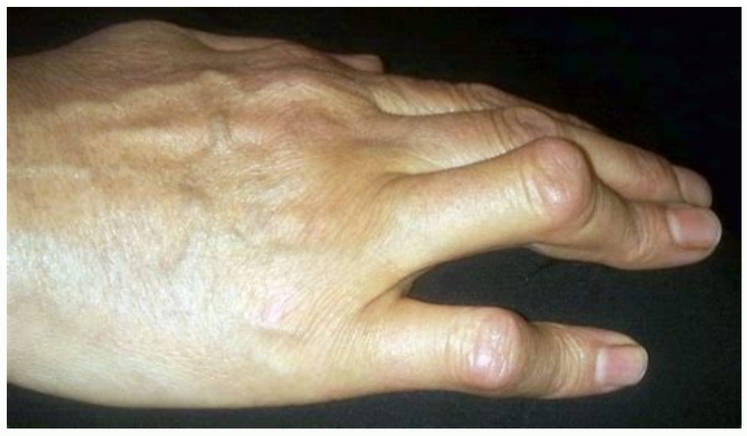
Boutonniere deformity radiopaedia











The mechanism is commonly a sudden forceful flexion of the DIP joint in an extended digit. Anatomy for Surgeons: The Back and Limbs. The triangular ligament is located between the conjoined tendons and serves to keep them centered over the finger.2The extensor mechanism is best evaluated on sagittal and axial MR images. A fluid-filled defect in the ulnar sagittal band (arrow) is seen adjacent to the central extensor tendon (arrowhead).Distal to the MCP joint, the extensor digitorum tendon divides into three parts, the central slip and two lateral bands. The odd zones are the joint areas (Zone I is at the level of the DIP joint, Zone III at the PIP joint, Zone V at the MCP joint, and Zone VII at the wrist). An avulsion fracture of the middle phalangeal base is often associated. Radiographics 2002; 22:237-256. The extrinsic muscles originate in the forearm and function to extend the metacarpophalangeal (MCP) and interphalangeal joints. These factors predispose to lacerations and also to closed injuries, including avulsions. With injury to the sagittal band, the extensor tendon will be subluxed or dislocated and the sagittal band will be discontinuous (7a, 8a). The areas of thickening medially and laterally (arrowheads) represent the contribution of the intrinsic tendons (oblique and transverse fibers) to the extensor mechanism. If more than 50% of the tendon is disrupted, it is typically primarily repaired.Zone III (PIP joint) injuries involve the insertion of the central slip and may be open or closed. Prior to the advent of MR imaging, clinical examination or tenography were utilized for evaluation of suspected tendon injuries. Clinical History: A 39 year-old female who cut her long finger on a tuna can presents with pain and limited extension at the MCP joint. The thin triangular ligament (arrowhead) joins the two conjoined tendons centrally.Mechanism of InjuryInjuries to the extensor tendons of the hand and wrist are common. Extensor Mechanism of the Fingers: MR Imaging " Anatomic Correlation. These commonly occur due to direct trauma, such as a human bite sustained during a fight. The sagittal bands attach volarly to the palmar plate of the MCP joint and dorsally to the extensor tendon. What are the findings" What is your diagnosis? The central extensor tendon (arrow) is centered by the restraining action of the thin sagittal bands (arrowheads). The even zones are between the joints. Initial treatment is splinting of the PIP joint in extension. The most common treatment is closed splinting with the DIP joint in extension.Injuries in Zone II (middle phalanx) are usually due to a laceration. These extrinsic and intrinsic muscles are joined and coordinated by a stabilizing array of fibrous structures known as the extensor mechanism.1MR imaging of the finger is technically challenging, but the use of optimized protocols, surface coils, and small fields-of-view often allow direct visualization of the components of the extensor mechanism. MRI of the Hand and Wrist. MR Imaging of Ligament and Tendon Injuries of the Fingers. Philadelphia, PA: Harper & Row, 1982.3 Berquist TH. Intermediate signal intensity material fills the defect. The insertion of the terminal tendon is seen at the proximal margin of the distal phalanx dorsally (arrow). Surgical indications include a displaced avulsion fracture, instability of the PIP joint, and chronic symptomatic digits.Zone IV (proximal phalanx) injuries and treatment considerations are similar to those encountered in Zone II.Zone V (MCP joint) injuries (like our test case) are almost always open injuries. A closed injury can occur to the sagittal bands, resulting in subluxation of the extensor tendon. A boutonniere deformity may develop as a late complication. The intrinsic muscles originate within the hand and serve to extend the interphalangeal joints and contribute to flexion of the MCP joints. The sagittal band remains intact radially (arrowhead), likely explaining why the patient was still able to slightly extend the MCP joint.DiagnosisLaceration of the extensor digitorum communis tendon just proximal to its insertion at the proximal phalangeal base.BackgroundFinger extension involves the coordinated action of both the extrinsic and intrinsic extensor muscles. The normal insertion of the central slip is seen at the proximal base of the middle phalanx (arrowhead). The central slip inserts on the base of the middle phalynx. The dorsal bundle of fibers is the central extensor tendon (arrow). The tendons are of low signal intensity on all pulse sequences. 9 Figure 9:(9a) A midline sagittal T1-weighted image through a normal finger. As the tendon is injured with the joint in flexion, the site of injury is usually proximal to the skin laceration. Therefore, a partial lesion is usually found in the even zones. Midline sagittal images are useful for evaluation of the insertion of the central slip and the terminal tendon (9a). Imaging of the Wrist and Hand. At the level of the MCP joint, the extensor digitorum tendon is joined by the sagittal bands, one of the main components of the extensor hood. Primary surgical repair is indicated. The sagittal bands appear as thin, low signal structures extending circumferentially from the volar plate to the central extensor tendon (6a). The tendon rupture may be partial or complete. 10 Figure 10:(10a) Axial T1 image at the level of the proximal phalanx. Typically, patients will present with pain and diminished function of the affected tendon. The central extensor tendon (arrow) is subluxed radially due to a defect in the ulnar sagittal band (arrowhead). They serve to stabilize the extensor tendon, limit proximal excursion of the tendon, and aid in extension of the proximal phalanx.2 5 Figure 5:(5a) A 3-D graphic representation of the extensor mechanism from the dorsal and lateral sides (illustration courtesy of Michael E. By understanding the normal appearance and function of the extensor mechanism, the injuries encountered can be accurately diagnosed and appropriate treatment can be undertaken.References1 Gilula LA and Yin Y. The most widely accepted is the Verdan system,4,5 which includes eight zones. 11 Figure 11:(11a) An Axial T1-weighted image at the level of the middle phalanx. Radiographics 2003; 23:593-611.5 Clavero JA, Alomar X, Monill JM, Esplugas M, Golano P, Mendoza M, Salvador A. Philadelphia, PA: Lippincott, 2003.4 Clavero JA, Golano P, Farinaas O, Alomar, X, Monill JM, Esplugas, M. The conjoined tendons (arrows) are located in the dorsomedial and dorsolateral aspects of the finger. 4 Figure 4:(4a) A fat-suppressed axial proton-density image obtained at the level of the long metacarpal head demonstrates absence of the extensor digitorum communis tendon centrally (arrow) with edema at the site of injury. Sagittal T1 (1a) and axial proton-density fat-suppressed (2a) images are provided. The lateral bands are joined by fibers from the intrinsic tendons, forming the conjoined tendons. The conjoined tendons merge distally to form the terminal tendon, which inserts on the base of the distal phalanx. As the conjoined tendons surround the dorsal half of the phalanx, a laceration seldom disrupts the entire extensor apparatus. 8 Figure 8:(8a) A coronal inversion recovery image from the same patient shown in (7a). 1 Figure 1:Sagittal T1 (1a) proton-density fat-suppressed image 2 Figure 2:Axial proton-density fat-suppressed (2a) imageFindings 3 Figure 3:(3a) On a sagittal T1-weighted image through the mid-portion of the long finger, there is a 7mm defect involving the distal portion of the extensor digitorum communis tendon (arrow). The patient often complains of pain and swelling at the MCP joint and a snapping sensation. Stadnick, M.D.).On axial MR images, the central extensor tendon is an oval low signal intensity structure that should be centered over the metacarpal head. The structures involved are thin and superficially located. Surgical repair of the sagittal band is often required in such cases.ConclusionWith its high spatial resolution and ability to differentiate adjacent soft tissues, MR allows excellent visualization of the structures of the digital extensor mechanism. The extensor mechanism is highly vascular, predisposing to formation of adhesions from the injured tendon to adjacent structures. Radiography remains an important examination to exclude bone avulsion or other subtle osseous injury.3TreatmentFor the purposes of diagnosis and treatment, extensor tendon injuries are classified into anatomic zones based on location. In these locations, the extensor mechanism is semicircular, covering the dorsal aspect of the finger. The specific appearance will depend upon the level of the finger imaged (10a,11a). It is important to be familiar with the normal anatomy so that injuries to this important structure can be identified and appropriate treatment undertaken.AnatomyThe extensor mechanism is one of the most complex structures in the hand (5a). To take full advantage of the benefits of MR imaging, the intricate anatomy of the extensor mechanism must be appreciated. In these locations, the extensor apparatus contains longitudinal fibers as well as transverse elements that keep the tendon centered and attached to the joint. If less than 50% of the tendon is involved, treatment consists of splinting followed by active motion. Philadelphia, PA: W.B. Saunders, 19962 Hollinshead, WH. 6 Figure 6:(6a) Axial T1-weighted image obtained at the level of the ring finger MCP joint. 7 Figure 7:(7a) Axial T1 weighted image at the level of the long MCP in a patient with pain following an injury. A brief summary of treatment options in injuries to the finger extensor mechanism (Zones I " V) follows.4,5Injuries in Zone I (the DIP joint) are typically closed and involve the terminal tendon insertion to the distal phalanx (mallet finger).