89. Fractures and Other Causes of Wrist Pain

MRI is accurate for the detection of carpal fractures. Findings are typical of nondisplaced fractures elsewhere in the musculoskeletal system, consisting of a fracture line flanked by edema-like SI. Figure 89.1 demonstrates a transverse, non-displaced fracture through the waist of the scaphoid. The fracture line appears as low SI on both (A) PD and (B) STIR T2WI, surrounded by marrow edema appearing as low and high SI on those respective sequences. Such edema may also be well-demonstrated on FS PDWI. Due to the distal origin of the proximal scaphoid's blood supply, fractures of the proximal scaphoid or the waist are susceptible to AVN. Images obtained two weeks later again demonstrate edema-like SI on (C) T1WI localized primarily to the proximal pole. On (D) post-contrast FS T1WI, however, the proximal pole, in distinction to the distal pole, does not enhance, signifying a lack of viable tissue therein. Over time, SI of the necrotic scaphoid will decrease on T2WI, indicating fibrosis and/or sclerosis. The same factors that predispose to AVN of the scaphoid—poor vascular supply, inadequate immobilization, or displacement—

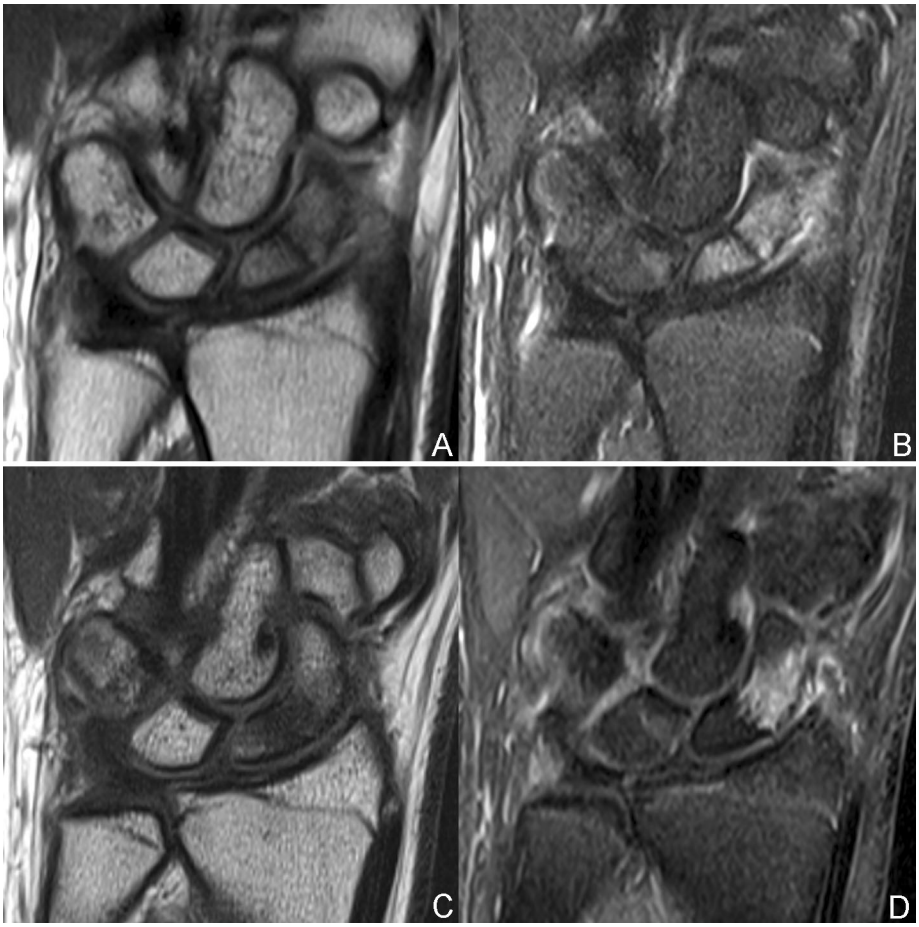

Fig. 89.1

also predispose to fracture nonunion, particularly of proximal scaphoid fractures and vertically-oriented fractures of its middle third. The presence of fluid or fibrous-like (i.e. low SI on all pulse sequences) SI between displaced fragments on MR signifies impending nonunion, while lack of a bone bridge within 6 months by definition constitutes nonunion. Type 1 nonunion is characterized by non-union of non-displaced fragments. Type 2 nonunion involves fragment instability, displacement greater than 1 mm, or dorsal intercalated segment instability (DISI)—distal lunate tilting yielding a scapholunate angle greater than 70 degrees. The scaphocapitate angle may be increased as well. If radioscaphoid arthritis is present, lesions are classified as type 3, whereas scapholunate collapse in the setting of AVN is termed a scaphoid nonunion advanced collapse (SNAC, type 4). With time resulting arthritis may diffusely involve the wrist (type 5). AVN of the lunate is called Kienbock's malacia (or lunatomalacia). The Lichtman classification divides lunate osteonecrosis into lesions that appear radiographically occult (stage 1), demonstrate sclerosis on conventional radiographs (stage 2), and demonstrate collapse without (stage 3A) or with (stage 3B) scapholunate dissociation. Lunate elongation on sagittal MRI is frequently seen in stage 3 lesions. Diffuse osteoarthritis of the wrist constitutes a stage 4 lesion. A fracture line is less uniformly seen with lunate fractures which are associated with ulnar negative variance. Viable tissue demonstrates typical edema-like SI, while nonviable bone—the presence of which reflects a poorer prognosis—often appears hypointense on both T1 and T2WI.

Inflammatory arthritis and ganglion cysts are other possible etiologies of wrist pain. In rheumatoid arthritis, MR reveals pannus formation around the carpal and metacarpophalangeal joints. This pannus tends to brightly enhance and when acute demonstrates decreased SI on T1WI and increased SI on T2WI. Chronic pannus demonstrates low SI on both T1WI and T2WI. Ganglion cysts are the most common tumors of the hand, often arising in close proximity to a major vessel. MR is useful both in identifying these lesions and in delineating their relationship to nerves, tendons, and vascular structures; such cysts may also be intracapsular. As seen in the axial T2WI of Fig. 89.2, the typical appearance is one of well-demarcated, homogenous, fluid-like SI (white arrow). The presence of a cystic soft tissue mass on MRI warrants contrast administration to rule out a sarcoma which will enhance, unlike benign cystic masses. Giant cell tumor of the tendon sheath may also enhance and typically exhibits low SI on T2WI (in part related to hemosiderin deposition).

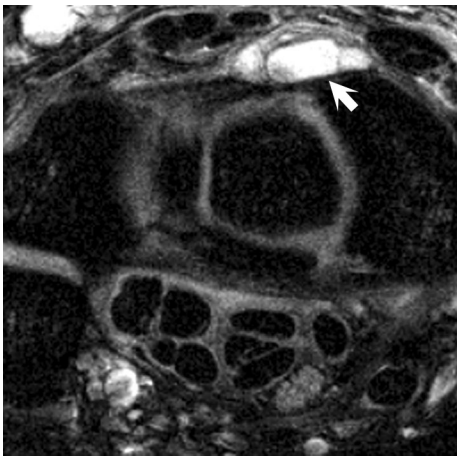

Fig. 89.2