

Magnetic Resonance Arthrography of the Wrist and Elbow



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KEYWORDS

- MR arthrography • Scapholunate ligament tear • Ulnar collateral ligament tear
- Olecranon stress fracture • Osteochondritis dissecans

KEY POINTS

- Magnetic resonance (MR) arthrography is highly sensitive and specific for the diagnosis of scapholunate ligament tears.
- MR dictations should state if tears are partial-thickness or full-thickness, and if the tearing involves the dorsal, membranous, and/or volar components of the ligament.
- Partial-thickness tears of the anterior band of the ulnar collateral ligament in overhead-throwing athletes are well evaluated with MR arthrography.
- Repetitive valgus elbow stress and rapid elbow extension during the late stages of throwing may result in an olecranon stress fracture, with propagation from a structural weak point in the trochlear groove.
- Osteochondritis dissecans of the elbow is an osteochondral injury classically seen in adolescent or young adult athletes, especially baseball pitchers, due to repetitive valgus impaction injury of the radial head and developing ossification center of the capitellum.

MAGNETIC RESONANCE ARTHROGRAPHY OF THE WRIST

Wrist pain is a common, nonspecific patient complaint that may be secondary to a variety of underlying processes, both degenerative and traumatic. Wrist trauma can be divided into 2 categories: low impact and high impact. High-impact trauma can lead to displaced fractures, dislocations, and acute tears of the ligaments and tendons, whereas low-impact trauma can lead to more occult injuries.¹ Both mechanisms can result in

injuries to the intrinsic and extrinsic carpal ligaments, as well as the triangular fibrocartilage complex (TFCC). Because the TFC is discussed in depth in the article by Cody et al, elsewhere in this issue, this article will not focus on its normal imaging appearance or pathology. Because clinical presentations can overlap significantly, magnetic resonance (MR) arthrography is essential in the diagnostic workup of such injuries. MR arthrography of the wrist is generally preferred over conventional MR imaging or computed tomography (CT) arthrography because of its high intrinsic contrast

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resolution, as well as the ability to evaluate extra-articular soft tissue pathology. MR arthrography is indicated to evaluate TFCC, intrinsic and extrinsic carpal ligaments, and the distal radial ulnar joint (DRUJ).²

Technique

The use of intra-articular contrast agents provides an effective means of evaluating the TFCC and interosseous ligaments of the wrist. There is variability among institutions as to whether to perform single-compartment (most commonly radiocarpal), 2-compartment, or rarely 3-compartment (radiocarpal, DRUJ, and midcarpal) arthrography before MR arthrography. Injections are most commonly performed under fluoroscopic guidance, but some radiologists prefer sonographic guidance.³ Radiocarpal injections are approached most commonly from a dorsal approach; however, some radiologists choose a lateral approach.⁴ With the patient supine on the fluoroscopy table, the patient's wrist is placed in a flexed position and bolstered with a rolled towel. The radiocarpal joint is visualized in profile and the skin overlying the joint is marked at the level of the mid scaphoid. After prepping and draping the dorsum of the wrist, local anesthesia is administered with a 25-gauge, 1.5-inch anesthesia needle from a dorsal approach, and the needle is advanced into the radiocarpal joint. Connector tubing flushed with injectate from the syringe is connected to the needle after dripping contrast into the needle hub to displace any air. Although some radiologists inject only a small amount of iodinated contrast to confirm needle placement before injecting the dilute gadolinium mixture, it is also acceptable to combine the iodinate contrast and gadolinium together. While taking rapid cine images, an approximately 3-mL mixture of iodinated contrast and dilute gadolinium is injected into the radiocarpal joint, or until resistance is perceived (Fig. 1). The gadolinium-based contrast used in MR arthrography is usually diluted in normal saline and/or iodinated contrast to a concentration of 1:250, which optimizes the paramagnetic effects of gadolinium at 1.5-T field strengths. After removal of the needle, the wrist is then briefly exercised and conventional arthrographic images are obtained in the anteroposterior, lateral, and oblique images before MR arthrography. Some radiologists also prefer taking dedicated spot imaging of the scapholunate (SL) ligament with ulnar deviation or clenched fist stress maneuver. This arthrographic imaging is diagnostic, and is instrumental in cases of patients unable to complete the MR portion of the examination for a variety of reasons.

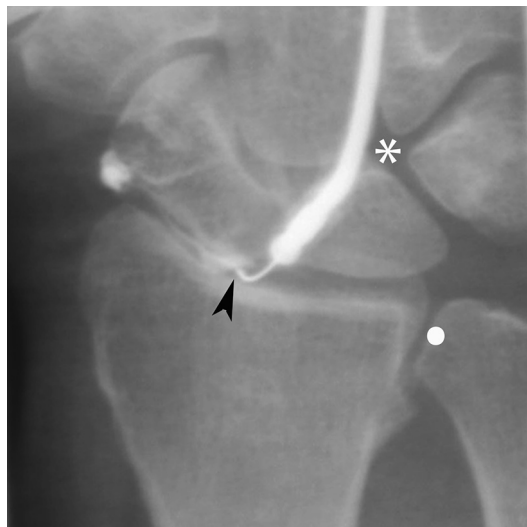


Fig. 1. Wrist arthrogram in a 70-year-old man before MR arthrography. Anteroposterior view of the wrist at the beginning of arthrogram demonstrates radiocarpal injection of 1:250 ratio of gadolinium to iodinated contrast through a 25-gauge needle (arrowhead) before MR arthrogram. Asterisk indicates site for midcarpal injection, and circle indicates site for distal radioulnar injection.

Midcarpal joint injections are most commonly performed from a dorsal approach into to the central portion of the 4-part junction of the lunate, triquetrum, hamate, and capitate. Distal radioulnar joint injection is performed from a dorsal approach, with the needle extending to the radial aspect of the ulnar head.

Contraindications

Besides the normal contraindications for MR imaging, the only absolute contraindication for arthrography is local infection of the skin or subcutaneous tissue.⁵ One would not want to contaminate a joint by crossing a needle through infected tissues. Usually, patients who cannot undergo MR arthrography are able to tolerate imaging with CT arthrography. For example, patients with implantable cardiac pacemakers who, with some recent exceptions due to new MR imaging-safe pacemakers, cannot undergo MR arthrography, can be safely evaluated with CT.⁵⁻⁸ A history of adverse contrast reactions with either iodinated or gadolinium-based agents is considered a relative contraindication and should be evaluated on a case-by-case basis.⁵

Complications

Arthrography is a generally well-tolerated procedure with few significant risks, and complications

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