MRI illustration of traumatic lipohemarthrosis of the wrist joint due to a scaphoid fracture

Shrey K. Thawait, MD; Josephina A. Vossen, MD; Gerard J. Muro, MD; and Ian Karol, MD

Traumatic lipohemarthrosis of the wrist joint in association with a scaphoid fracture is an unreported entity. We present the first case report of MRI appearance of a double fluid-fluid level of lipohemarthrosis caused by a scaphoid fracture. The presence of a double fluid-fluid level within the injured joint definitively establishes a lipohemarthrosis. A traumatic lipohemarthrosis is considered synonymous with an intra-articular fracture and has important implications for patient management. A limited MRI scan for diagnosis or exclusion of scaphoid fracture may be more cost-effective than expectant management and subsequent followup visits.

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All the authors are at the Bridgeport Hospital and Yale University, Bridgeport CT. Contact Dr. Thawait at sthawai2@jhmi.edu.

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Discussion

In an original research article, Lugo-Olivieri et al suggested that a single fluid-fluid level could also be seen with an intra-articular hemorrhage, without the presence of fat...
in the joint cavity (3). They suggested instead that a double fluid-fluid level may be a more specific finding for lipohemarthrosis. Blood in the synovial fluid separates into highly concentrated, dependent red cells with high hemoglobin and iron content and near-water density of floating serum, creating the first fluid-fluid level. Due to gravity, fat (which is lighter than serum) rises above, resulting in another fluid-fluid level. The end result is two fluid-fluid levels with a lipohemarthrosis. The first fluid-fluid level is located between the fat layer (lightest) and the serum layer (intermediate). The second fluid-fluid level is located between the serum layer (intermediate) and the dependent red-cell layer with high hemoglobin and iron content (black asterisk).

The scaphoid is the most common carpal bone to fracture (8). In spite of this, there are many reasons why a traumatic lipohemarthrosis associated with a scaphoid fracture has not been described. First, due to the small size of the joint cavity, it is difficult to appreciate a fluid-fluid level on plain radiographs. Furthermore, MRI for a suspected scaphoid fracture is almost never performed in the acute phase. We believe that after the several days of immobilization, fat and blood products are resorbed by the synovial membrane. This hypothesis remains to be tested in a clinical/experimental study. An experimental cadaver study demonstrated the presence of three different levels representing fat, serum, and blood cells on the T2-weighted images three days after injection of a mixture of fat and blood (5). We believe that the short time interval between injury

Figure 1. 14-year-old male with traumatic lipohemarthrosis of the wrist joint. MRI appearance of lipohemarthrosis. Axial, fat-saturated, T2-weighted image at the level of the proximal carpal row demonstrates lipohemarthrosis. Note the three different signal intensities of fat, serum, and dependent red cells. Anterior or top layer (white asterisk) is of low signal intensity and represents fat. The first fluid-fluid level (arrow) shows the fat floating above the near-water density of serum (curved arrow). The second fluid-fluid level (arrowhead) separates the serum layer (curved arrow) and the dependent red cell layer with high hemoglobin and iron content (black asterisk).

Figure 2. 14-year-old male with traumatic lipohemarthrosis of the wrist joint. MRI appearance of lipohemarthrosis. Sagittal, T1-weighted image at the level of the capitate bone demonstrates the lipohemarthrosis. The fat, serum, and dependent red cells are seen as three different signal intensities. The top layer (white asterisk) is of higher signal intensity on this image when compared to the fat-saturated image (Fig. 1). This is consistent with fat density. The first fluid-fluid level (arrow) shows the fat layer floating above the near-water density of serum layer (curved arrow), as in Fig. 1. Again, as seen in the first figure, the second fluid-fluid level (arrowhead) separates the serum layer (curved arrow) and the dependent red-cell layer with high hemoglobin and iron content (black asterisk).

Figure 3. 14-year-old male with traumatic lipohemarthrosis of the wrist joint. Coronal, T1-weighted image shows the distal scaphoid fracture (arrow).
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Figure 4. 14-year-old male with traumatic lipohemarthrosis of the wrist joint. Coronal, fat-saturated, T2-weighted image shows the distal scaphoid fracture (arrow). Note the high signal intensity showing the bone-marrow edema due to acute fracture.

Figure 5. 14-year-old male with traumatic lipohemarthrosis of the wrist joint. Volume-rendered image (coronal) obtained from the original dataset redemonstrates the fracture line (arrow).

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