MR-Arthrography of the Hip

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Introduction

This article describes the technique and findings of MR-Arthrography (MRA) of the hip joint, with special regard to the clinical setting of femoro-acetabular impingement.
MRA of the hip joint is a technique that uses intra-articular contrast medium, high field scanners and dedicated coils and sequences. With this technique only, one is able to detect subtle, but important changes of labrum, cartilage and bone of the hip joint. Today the direct MRA technique is widely used among musculoskeletal radiologists.

Examination Technique

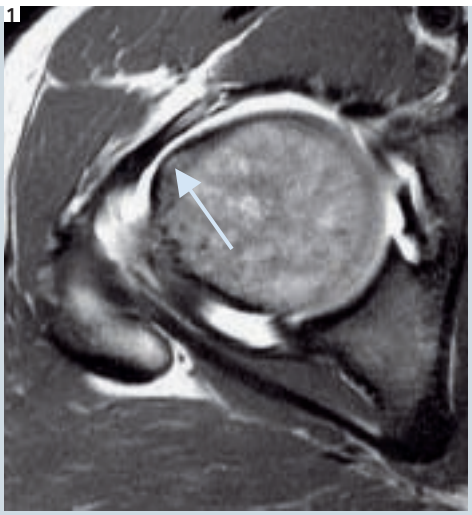
Under fluoroscopic control, a 22-gauge spinal needle is introduced from ventral into the joint in the outer third of the head/neck-junction. Then 10 to 20 cc of diluted Gadolinium is injected.
All examinations are performed with a 1.5T Magnet (MAGNETOM Avanto, Siemens Medical Solutions, Erlangen, Germany). On the MR table a flex coil is positioned over the joint. After a short localizer in three planes the following sequences are used:
1. Axial T1-weighted sequence to assess bony structures and pathologies and also capsule configuration and thickness, as well as periarticular soft tissue changes (TR 650, TE 20, 200 mm field of view, 224 x 512 matrix, 4 mm slice thickness section thickness with a 0.2 mm section gap, 17 slices, 3 min).
2. Axial FLASH-sequence with a few thin slices, centered on the upper joint-space. This sequence is used to evaluate the version of the acetabulum and subcortical hypersclerosis and cystic changes of the acetabular rim (TR 550, TE 10, Flip angle 90°, 120 mm field of view, 256 x 256 matrix, 2 mm section thickness with a 0.1 mm section gap, 11 slices, 3:06 min).
3. Coronal-oblique protondensity-weighted (PDW) thin-slice sequence especially for the evaluation of the cartilage and its damages (TR 3200, TE 15, 120 mm field of view, 256 x 256 matrix, 2 mm section thickness with a 0.1 mm section gap, 23 slices, 5 min). This sequence is aligned perpendicular to the femoral neck and is marked on the axial T1-weighted sequence.
4. PDW sequence in sagittal direction also for cartilage assessment (TR 3200, TE 196 15, 120 mm field of view, 256 x 256 matrix, 2 mm section thickness with a 0.2 mm section gap, 23 slices, 5:37 min).
5. Radial PDW sequence is used in which all slices are oriented basically orthogonal to the acetabular rim and labrum. This sequence is based on a sagittal oblique localizer, which is marked on the PDW coronal sequence, and runs parallel to the sagittal oblique course of the acetabulum (TR 2000, TE 15, 260 mm field of view, 266 x 512 matrix, 4 mm section thickness, 16 slices, 4:43 min). In the center of the radial sequence, where the slices cross over, the signal wipes out. This produces a broad line without signal on the image, which affects the quality of the image. The more slices cross over, the broader the no signal line becomes. To reduce this artifact, this sequence is split into two sequences with 8 slices each. The whole examination, including the hip injection, lasts approximately 50 to 60 min.

Findings

In the impingement patients we found osseous changes, like retroversion of acetabulum and acetabular cysts. Osseous bumps and deformation of the femoral head/neck junction.
Often labral tears and ganglions are detected.
The PDW sequences showed nicely various cartilage defects and capsular thickening or scarring after surgical procedures.

References

1 Leunig M, Podeszwa D, Beck M, Werlen S, Ganz R, Magnetic resonance arthrography of labral disorders in hips with dysplasia and impingement., Clin Orthop 418, 74–80, Jan, 2004.
2 Locher S, Werlen S, Leunig M, Ganz R, [MR-Arthrography with radial sequences for visualization of early hip pathology not visible on plain radiographs], (Arthro-MRI mit radiarer Schnittsequenz zur Darstellung der praradiologischen Huftpathologie.), Z Orthop Ihre Grenzgeb 140: 1, 52–7, Jan–Feb 2002.
3 Magnetic Resonance Arthrography of the Hip in Femoroacetabular Impingement: Technique and Findings Stefan Werlen MD, Michael Leunig MD†, and Reinhold Ganz MD† Operative Techniques in Orthopaedics Volume 15, Issue 3 , July 2005, pages 191–203.
4 Werlen S, Porcellini B, Ungersböck A, Magnetic resonance Imaging of the hip joint. Seminars in Arthroplasty, Vol 8, Jan 1997.

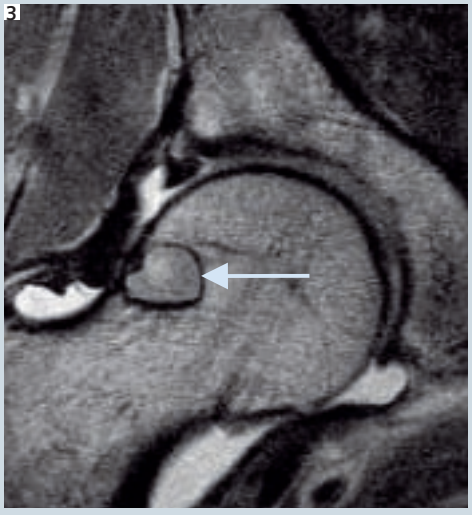


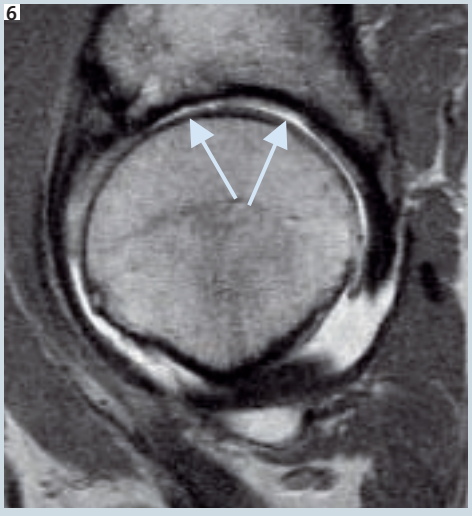
1 2 Osseus bump at the anterosuperior femoral neck, causing Cam Impingement.

3 Impingement cyst at the anterosuperior femoral neck.

4 White arrow indicating rupture of labral base.

5 Huge intra- and extracapsular labral ganglion.





6 Focal cartilage ulcers at the acetabular joint surface.

7 Cartilage rupture and flap formation at the femoral head in pincer type impingement.

8 Extensive postoperative thickening and scarring of joint capsule.