Imaging of hip articular cartilage and acetabular labrum with novel oblique MRI sequences

Albert Lu MD, Thomas G Sampson MD, David W Stoller MD FACR
Radnet Medical Imaging, San Francisco, CA
Disclosure

• The authors have no financial relationships to disclose
MRI of the hip

• Accurate MRI imaging of hip articular cartilage and acetabular labrum is challenging due to relatively thin articular cartilage in the hip and its spherical geometry.
MRI of the hip

• Conventional coronal MR sequences provide only 1-2 slices of optimized visualization of cartilage and labrum without loss of resolution, namely at zone 3, where the scan plane is perpendicular to the curved acetabular roof.
Zone 3 on Coronal PDFS

- Acetabular articular cartilage
- Lateral (superior) acetabular labrum
- Femoral head articular cartilage
Cartilage Blurring at Zone 2 on Coronal PDFS

Blurring of acetabular articular cartilage in zone 2
Coronal Oblique Imaging

• To better evaluate articular cartilage and labrum corresponding to arthroscopic zones 2 and 4, we developed novel anterior and posterior oblique proton density fat sat (PDFS) sequences to allow imaging planes perpendicular to anterosuperior and posterosuperior cycloid curvatures of the acetabular roof.
Plane of Obliquity for Anterior Oblique
PDFS
Zone 2 on anterior oblique coronal PDFS

Anterior-superior labrum

Acetabular cartilage in zone 2
Plane of Obliquity for Posterior-Oblique PDFS
Zone 4 on posterior oblique PD FS

Posterior-superior labrum

Zone 4 acetabular cartilage
Methods

• 41 consecutive MRIs were performed with protocols that included anterior and posterior oblique PDFS sequences
• 13 of the 41 cases were excluded due to prior hip surgery
• Consensus interpretation by two musculoskeletal radiologists
Methods

• Standard coronal PD FS images compared with anterior oblique PD FS images for zone 2 pathology
• Standard coronal PD FS images compared with posterior oblique PD FS images for zone 4 pathology
Results – Anterior Oblique

• The anterior oblique sequence demonstrated 5 cases of cartilage delamination in zone 2 not seen on standard coronal image
• 2 cases in which standard coronal sequence underestimated the degree of chondral loss
• No increased detection in labral pathology in zone 2
Standard coronal PDFS in zone 2

Blurred acetabular cartilage
Anterior oblique PDFS

Hyperintense basal layer of acetabular cartilage consistent with delamination
Standard coronal PDFS in zone 2

Blurred acetabular cartilage
Anterior oblique PDFS

Grade 4 chondral loss in zone 2
Results – posterior oblique

- 3 cases of cartilage delamination in zone 4 not evident on standard coronal PDFS
- 4 cases of grade 3-4 chondral loss not evident on standard coronal PDFS
- Posterior oblique sequences demonstrated 2 labral tears in zone 4 not evident on standard coronal sequence
Blurred acetabular cartilage in zone 4
Posterior oblique PDFS

Grade 4 cartilage loss in zone 4
Standard Coronal PDFS

No apparent tear in the posterior superior labrum on Coronal PDFS
Posterior oblique PDFS

Chondrolabral junction tear at zone 4
Conclusion

• Anterior and posterior oblique PDFS images improved detection of chondral pathology in zone 2 and zone 4, respectively

• Oblique images may also improve detection of labral tears
References