

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

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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



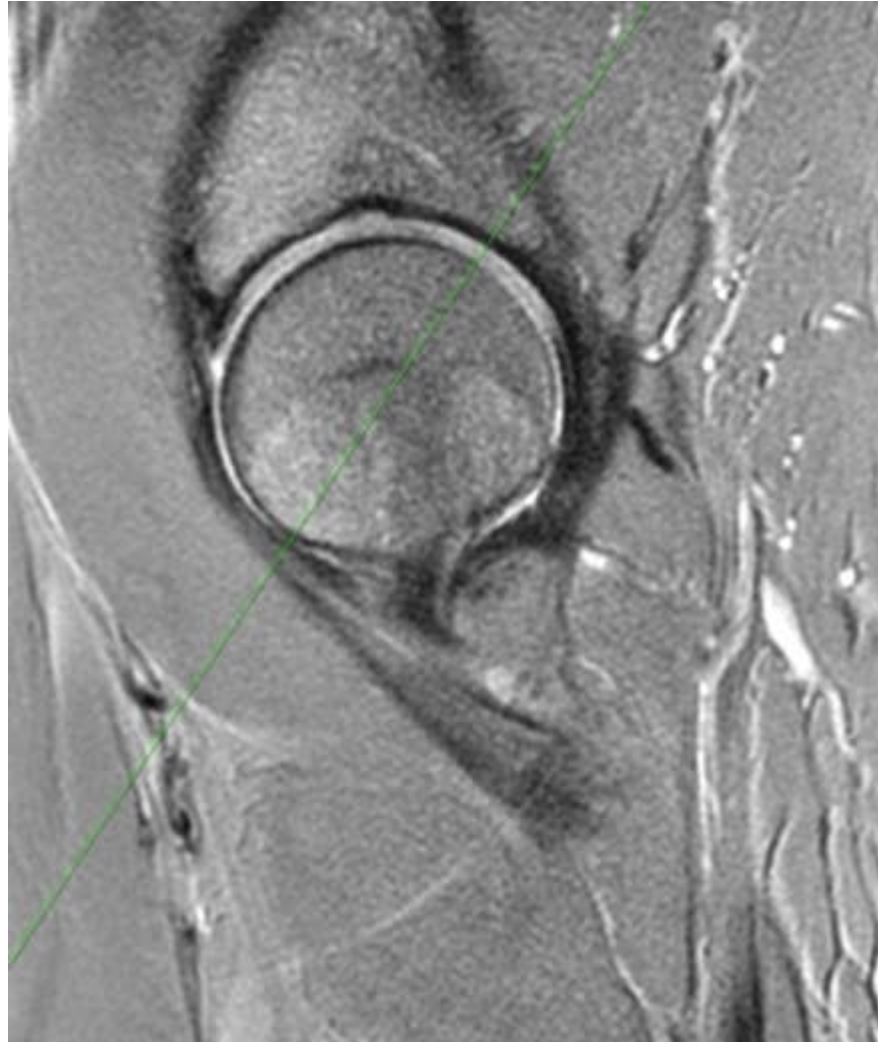
Zone 2 on anterior oblique coronal PDFS



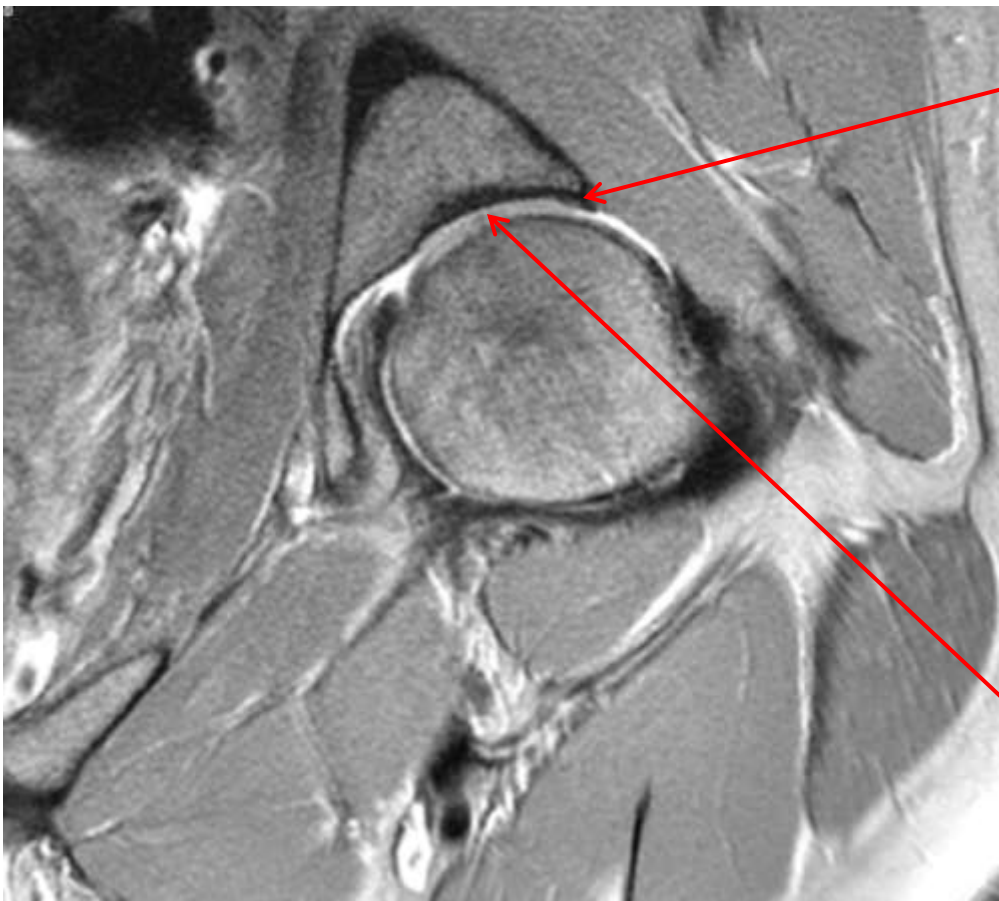
Anterior-superior
labrum

Acetabular
cartilage in zone 2

Plane of Obliquity for Posterior-Oblique PDFS



Zone 4 on posterior oblique PDFS



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

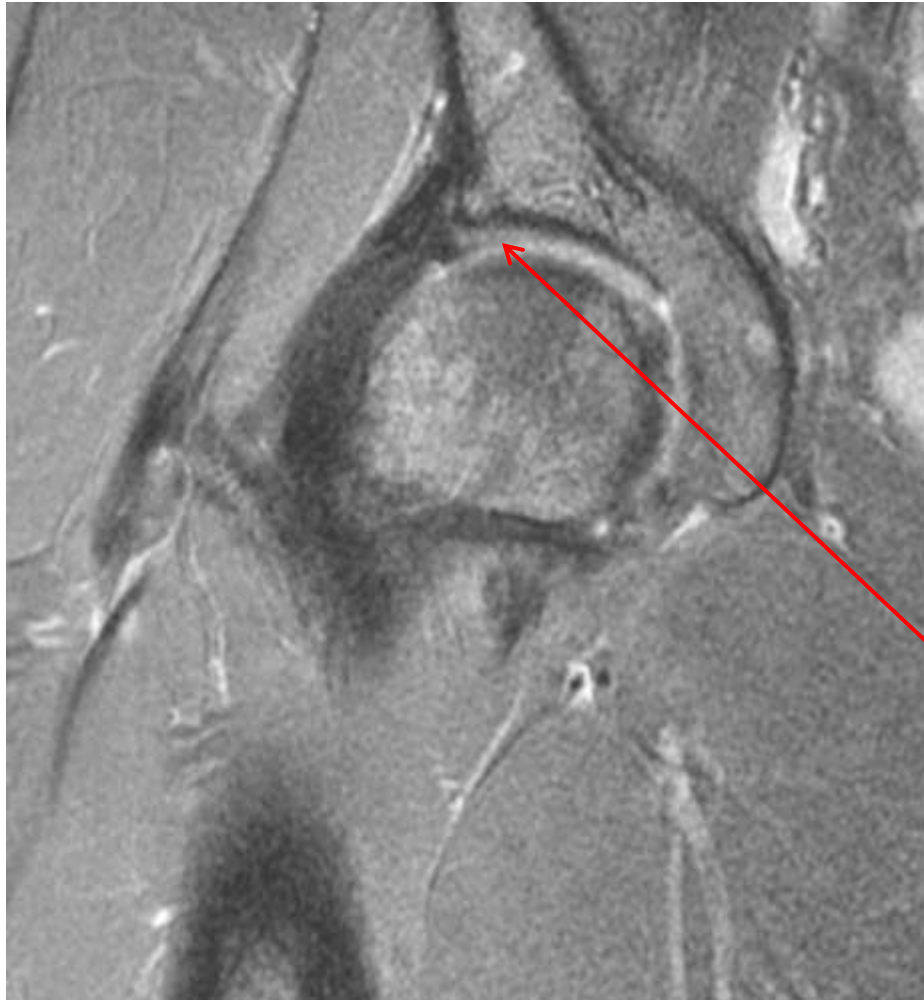
Methods

- 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

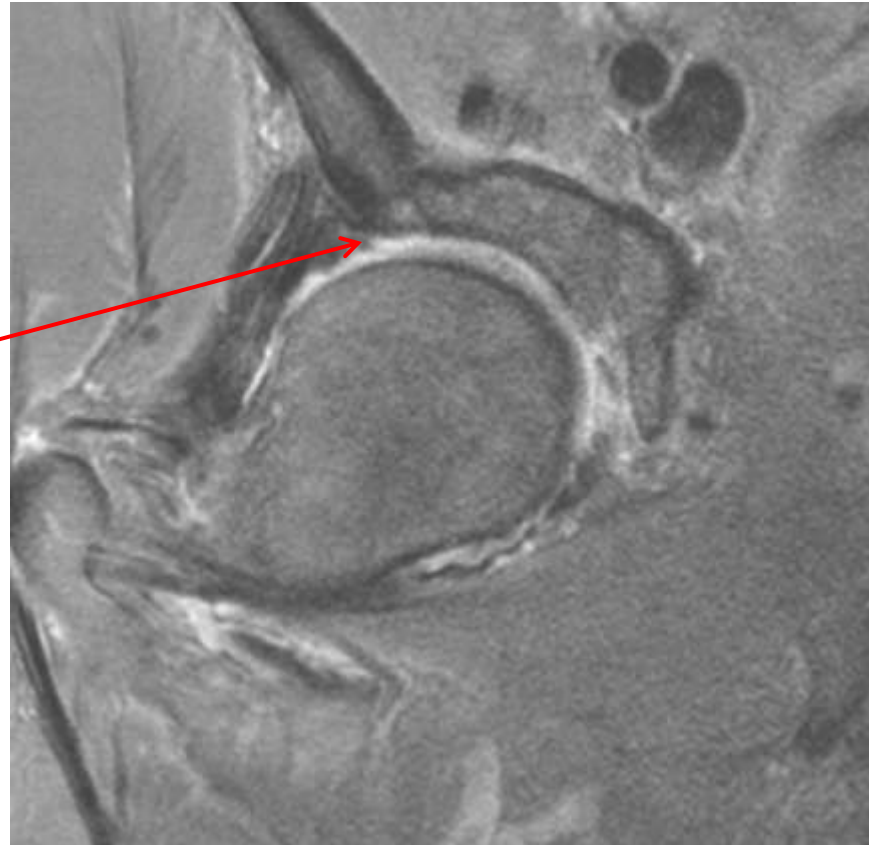
Standard coronal PDFS in zone 2

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

Standard Coronal PDFS

Blurred acetabular
cartilage in zone 4



Posterior oblique PDFS



Grade 4 cartilage loss
in zone 4

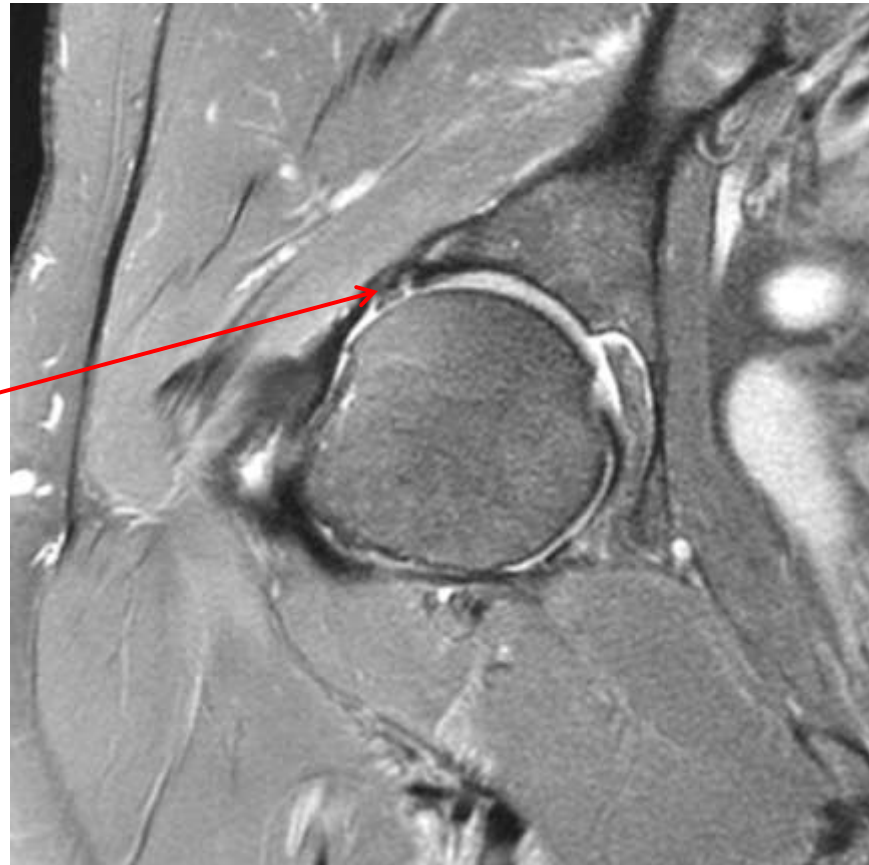
Standard Coronal PDFS



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

- Ilizaliturri et al. A geographic zone method to describe intra-articular pathology in hip arthroscopy: cadaveric study and preliminary report. *Arthroscopy*. 2008 May;24(5): 534-9
- Link TM, Schwaiger BJ, Zhang AL. Regional Articular Cartilage Abnormalities of the Hip. *Am J Roentgenol*. 2015 Sept 205(3): 502-12