



## CORR Insights

# CORR Insights®: What MRI Findings Predict Failure 10 Years After Surgery for Femoroacetabular Impingement?

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## Where Are We Now?

The study by Hanke and colleagues brings to light several important issues pertaining to the practice of joint preservation surgery for FAI. First, are standard radiographs still of any value when evaluating and treating patients for FAI, or should magnetic resonance

arthrogram (MRA) be the standard imaging study? Second, if these radiographic features are not seen on standard radiographs, are we diagnosing FAI too late in its natural history? Finally, do these data support or refute the concepts of “universal screening for FAI” or prophylactic surgery?

Standard hip radiographs have been the mainstay for diagnosis and treatment of FAI for at least two decades. In 2004, a landmark study [2] demonstrated that patients undergoing FAI surgery had a higher risk of poor Harris hip scores if they were older than 40 years of age, had Tönnis Grade 2 of radiographic osteoarthritis (OA), and had MRI evidence of translation of the femoral head into an acetabular cartilage defect. Furthermore, for arthroscopic FAI surgery, Phillipon

and colleagues [7] noted that radiographic evidence of joint-space narrowing greater than 2 mm were associated with poor Harris hip scores. These radiographic criteria have been used as a means of selecting patients and avoiding unnecessary surgery and should still be considered valuable when evaluating FAI patients.

The current study, however, illustrates the power of MRA in redefining the FAI process, as more than 95% of patients in the cohort presented had a Tönnis Grade 0 or 1, but had MRA imaging findings that were associated with a poor prognosis. MRA has long been used as a diagnostic tool to evaluate the cartilage and labrum prior to FAI surgery and a few studies have correlated MRA findings with outcome [5, 6]. Radial formatted images have routinely been used to evaluate the size of the cam deformity. However, scant attention has been placed on how these images can detect radiographic features that portray a “hip at risk.”

Up to 90% of total hip replacements performed in patients younger than 55 years of age have an underlying

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diagnosis of either hip dysplasia or FAI [3]. The MRA features described in this study as associated with unfavorable results were seen even in the youngest patients. These early radiographic MRA findings describe what should be considered a “hip at risk” and may tip the scale in favor of early detection of FAI. Should our students, athletes, or pretty much anybody be screened for FAI in the same way we screen for scoliosis? We published data on a group of asymptomatic adolescent athletes with decreased ROM [9]. Patients with decreased ROM were more likely to have radiographic features associated with FAI and early cartilage or labral pathology as evidenced on MRI. This paper may further support the concept of universal screening.

The data obtained from this study are useful for the surgeon, but should be interpreted with caution. First, the features associated with poor prognosis were also seen in patients who did not have radiographic progression or require a THA. Therefore, there must be factors other than the initial MRA finding that must be associated with progression such as activity level or its modification after surgery that were not assessed in the paper, and that may shift the failure curve up or down. Secondly, failure was defined as progression in OA and a Harris hip score of less than 80 at 10 years. As more

papers on the outcome of FAI surgery in past 10 years are published, we should prepare to interpret what should be considered either a success or failure of treatment.

### Where Do We Need To Go?

There always seems to be a need for improved imaging modalities for the diagnosis of musculoskeletal disorders. The authors have shown the importance of radial MRA sequences in the diagnosis of FAI. Despite the costs and minor risks associated with MRA imaging, I believe a review of these radial sequences to detect features that may be associated with progression of arthritis should be mandatory in the workup of patients with FAI.

The surgical treatment of FAI remains controversial. In the United States, certain insurance companies may deny FAI impingement surgery on the grounds that the treatment is investigational or not evidence-based. Two-thirds of the patients in this paper had favorable results at 10 years with no progression in OA or need for THA. Although the current study supports the concept of FAI surgery as a means of salvaging symptomatic hips and helps delineate the patient less likely to benefit from the intervention, further attention is needed to determine

whether delaying a hip replacement 10 years should be considered a success or failure. Should we recommend surgery to manage pain in a young patient who has MRA features associated with potential progression of arthritis when there are no signs OA on radiographs? The answer to this question is quite complex and requires a thoughtful discussion with the patient regarding his or her expectations.

Although the end result—arthritis—is the same in all patients to get there, the mechanism of joint degeneration is not yet well understood. Despite previous studies on the natural history of FAI [1, 4], we still are missing key information regarding the progression of OA in the impinging hip. Our recent paper [8] showed an increase in degeneration for dysplastic hips, but no difference in the natural history in the progression of OA between FAI and normal hips. All patients had a contralateral THA, which we considered a limitation in our study. Since FAI damage is considered to be ROM-induced, and therefore an activity-related phenomenon, then having a contralateral THA could limit the damage that occurred in hips with FAI morphology. It is mandatory for us to better understand the natural history of this disorder so that we can confidently continue to recommend impingement surgery.

# CORR Insights

A simple hip exam can detect the decreased hip ROM associated with FAI. Hip radiographs will detail the morphology associated with cam or pincer impingement, but should we obtain an MRA with radial sequences to look for early ominous signs as a way to give recommendations regarding sporting participation or activity modification? This study would favor early detection of “hips at risk” as a way to ultimately delay progression in those that choose to modify their activities.

The value of MRI in FAI has been established, but we still lack data in regards to the use of radial sequences for identifying the early signs of OA such as those shown in this paper. The reproducibility of these radiographic features needs to be further studied. The musculoskeletal radiologists associated with this paper have a vast experience using radial sequences for the diagnosis of FAI; can this be reproduced elsewhere, and is it ready for universal implementation? Healthcare providers for patients with FAI including radiologists, orthopaedic surgeons, physiatrists, and sports trainers should be aware and trained in these relatively new features of a well-known diagnostic tool.

## How Do We Get There?

The MRA findings described in this paper should be used to design

randomized controlled trials for FAI surgery versus conservative management. The progression of MRA findings could be used as one outcome measure to follow for years, and not decades; time that would be required to see radiographic evidence of OA.

A screening tool to identify patients at risk for hip damage would be ideal, but needs further processing. The association between activity level and progression of hip damage needs to be delineated further. Most importantly, we would need to decide what to do with the information, especially if a change in behavior is expected. Clearly, early detection of hip disease would be mandatory in order to prevent progression of OA and the need for joint preservation or replacement surgery.

Finally, although the data presented here are new and intriguing, and they prompt the need for early detection or prevention of hip damage caused by FAI, without further information regarding the natural history of FAI, prophylactic surgery should not be recommended.

## References

1. Bardakos NV, Villar RN. Predictors of progression of osteoarthritis in femoroacetabular impingement: A radiological study with a minimum of ten years follow-up. *J Bone Joint Surg Br.* 2009;91:162–169.
2. Beck M, Leunig M, Parvizi J, Boutier V, Wyss D, Ganz R. Anterior femoroacetabular impingement: Part II. Midterm results of surgical treatment. *Clin Orthop Relat Res.* 2004;418:67–73.
3. Clohisy JC, Dobson MA, Robison JF, Warth LC, Zheng J, Liu SS, Yehyawi TM, Callaghan JJ. Radiographic structural abnormalities associated with premature, natural hip-joint failure. *J Bone Joint Surg Am.* 2011;93:3–9.
4. Hartofilakidis G, Bardakos NV, Babis GC, Georgiades G. An examination of the association between different morphotypes of femoroacetabular impingement in asymptomatic subjects and the development of osteoarthritis of the hip. *J Bone Joint Surg Br.* 2011;93:580–586.
5. Krych AJ, King AH, Berardelli RL, Sousa PL, Levy BA. Is subchondral acetabular edema or cystic change on MRI a contraindication for hip arthroscopy in patients with femoroacetabular impingement? *Am J Sports Med.* 2016;44:454–459.
6. Larson CM, Giveans MR, Taylor M. Does arthroscopic FAI correction improve function with radiographic arthritis? *Clin Orthop Relat Res.* 2011;469:1667–1676.
7. Philippon MJ, Briggs KK, Yen YM, Kuppersmith DA. Outcomes following hip arthroscopy for femoroacetabular impingement with associated chondrolabral dysfunction: Minimum two-year follow-up. *J Bone Joint Surg Br.* 2009;91:16–23.
8. Wyles CC, Heidenreich MJ, Jeng J, Larson DR, Trousdale RT, Sierra RJ.

# CORR Insights

The John Charnley Award: Redefining the natural history of osteoarthritis in patients with hip dysplasia and impingement. *Clin Orthop Relat Res.* [Published online ahead of

print April 12, 2016]. DOI: [10.1007/s11999-016-4815-2](https://doi.org/10.1007/s11999-016-4815-2).

9. Yuan BJ, Bartelt RB, Levy BA, Bond JR, Trousdale RT, Sierra RJ. Decreased range of motion is

associated with structural hip deformity in asymptomatic adolescent athletes. *Am J Sports Med.* 2013;41:1519–1525.