

Imaging in Hip Arthroscopy for Femoroacetabular Impingement

A Comprehensive Approach



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KEYWORDS

- Hip arthroscopy • Femoroacetabular impingement • Imaging • MRI • MRA
- Hip capsule • CT • Revision hip arthroscopy

KEY POINTS

- Plain radiographs, including anteroposterior pelvis, Dunn lateral, and false-profile view, are key in initial assessment of patients suspected of femoroacetabular impingement.
- Computed tomography scans rely less patient positioning and allow for accurate definition of the exact location and size of pincer-type and cam-type deformities, and can be particularly helpful in revision hip arthroscopy.
- Studies have shown high incidence of labral tears in asymptomatic patients, thus correlation between clinical and imaging findings is stressed.
- Systematic implementation of intraoperative fluoroscopy can assist in providing adequate acetabular and femoral decompression and avoid the most common cause of revision hip arthroscopy.

INTRODUCTION

The role of diagnostic imaging in femoroacetabular impingement (FAI) is to complement the clinical presentation and findings on physical examination. Diagnostic imaging provides objective information to the clinician, separate from confounding

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variables and unclear history. This can support or negate FAI among competing diagnoses. That said, abnormal femoral morphology and other findings consistent with FAI alone are not diagnostic for FAI if the corresponding clinical findings and/or symptoms are absent.¹ As a result, during initial work-up and preoperative planning, it is critical to choose the right diagnostic studies to answer the clinical questions at hand.

This article provides a comprehensive approach to imaging in FAI, from initial office-based radiographs to advanced preoperative 3-dimensional (3D) imaging. At any point imaging is used, it is important to evaluate the whole picture and consider pelvic joint abnormalities and muscular injuries that may mimic the symptoms or findings of FAI.

PLAIN RADIOGRAPHY

Plain radiographs play a key role in initial management of patients presenting with hip pain when FAI is suspected. Several options exist regarding views and these should be fully understood to optimize information obtained. From these radiographs, several parameters can be obtained to help evaluate patients before hip preservation surgery. These same radiographs can be helpful when considering revision hip arthroscopy and postoperative correction of deformity.

Anteroposterior (AP) pelvis radiograph is obtained routinely with patients positioned supine with the legs internally rotated by 15°. To allow optimal evaluation, the radiograph beam should be centered between the pubic symphysis and the anterior superior iliac spine.² AP pelvis radiographs are particularly useful for identification of the presence of osteoarthritis and measurement of joint space remaining to classify the degree of joint space loss. The Tönnis grade can be helpful to quantify the amount of joint space narrowing.³ Patients with Tönnis grade 2 or more generally benefit less from hip preservation.² Several important radiographic parameters allow for detailed analysis of morphology on both the acetabular and femoral sides. These parameters should take into account the relative tilt of the pelvis and rotation by evaluating symmetry and bony relationships because this has a profound influence on acetabular version.⁴

Pincer-type FAI is appreciated on the AP radiograph by presence of acetabular retroversion, overcoverage, coxa profunda, protrusio acetabula, and increased anterior center-edge angle or lateral center-edge angle (LCEA).⁵ Measurement of the lateral and anterior center-edge angle are helpful screening measures in most cases; however, there are abnormal acetabular morphologic variants that may not always be defined by these parameters. Measuring the LCEA and acetabular inclination angle (Tönnis angle) are measurements that can characterize acetabular morphology. Global overcoverage has been defined as an LCEA greater than 40° and Tönnis angle less than 0° (Fig. 1). Acetabular dysplasia can be defined by LCEA less than 20° and Tönnis angle greater than 10°. There are other radiographic findings that may be relevant, such as Shenton line, femoral version, and neck shaft angle.

Coxa profunda is now recognized as potentially a normal variant in many individuals.^{6,7} Evaluation for acetabular dysplasia is crucial to successful patient selection.⁸ When the center of the femoral head extends beyond the ilioischial line, acetabular protrusio may be present, representing global overcoverage of the femoral head.^{9–11} Presuming a proper pelvic tilt on AP pelvic radiograph, a crossover sign denotes that the anterior wall of the acetabulum projects lateral to the posterior wall before converging at the lateral acetabular sourcil. Once a crossover sign is recognized, quantification can be achieved by measuring the retroversion index, which can be helpful in planning surgical correction.^{10,12} A posterior wall sign indicates that the center of the femoral head projects lateral to the posterior wall, which is another sign of true

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