The Importance of Sex of Patient in the Management of Femoroacetabular Impingement

Andrea Halim, MD, Raghav Badrinath, BS, and Cordelia W. Carter, MD

Abstract

Femoroacetabular impingement (FAI), a recently described hip condition in adolescents and young adults, typically manifests as activity-related hip pain. Characteristic physical findings include limited passive internal rotation of the affected hip and a positive impingement sign. Diagnostic imaging may reveal cam and/or pincer lesions, and associated intra-articular pathology (eg, labral tear, chondral damage) is common. When nonoperative treatment fails to adequately alleviate symptoms, surgery may be warranted. Both open and arthroscopic techniques have been effective.

As our understanding of FAI continues to evolve, sex-based differences in incidence, presentation, and outcomes for patients with FAI have become apparent. Understanding the different ways in which males and females may present with FAI and then changing clinical practice patterns to accommodate these sexual dimorphisms will likely result in improved outcomes for each patient with symptomatic FAI.

Femoroacetabular impingement (FAI), a recently described hip condition in adolescents and young adults, results from abnormal physical contact between the proximal femur and the acetabulum. FAI is usually characterized by the site of the predominant morphologic abnormality—proximal femur (cam-type FAI), acetabulum (pincer-type FAI), or both (mixed impingement). Cam-type FAI is typified by the aspherical extension of the articular surface at the anterosuperior head–neck junction of the proximal femur with loss of the normal offset. With hip motion, especially in the maximal ranges of flexion and internal rotation, the aspherical proximal femur repeatedly contacts the anterosuperior acetabulum, damaging the chondrolabral junction and ultimately the labrum itself. In pincer-type impingement, femoral head overcoverage caused by acetabular retroversion and/or coxa profunda directly damages the anterior labrum when the acetabular rim contacts the proximal femur during physiologic motion. “Contrecoup” injury of the posterior-inferior acetabular cartilage may also occur. Over time, recurrent microtrauma to the acetabular cartilage and/or labrum may lead to degenerative changes of the hip and ultimately to premature osteoarthritis.1,2

Patients with FAI typically present with groin pain that may be activity-related or that may occur with prolonged sitting with the hip in a flexed position. Physical examination findings suggestive of FAI include decreased passive internal hip rotation and reproducible pain with adduction and internal rotation of the flexed hip—the impingement sign, or the flexion, adduction, and internal rotation (FADIR) test.3 Diagnostic imaging evaluation initially includes radiographs of the pelvis and hips. These radiographs may show a “pistol-grip” deformity and/or decreased head–neck offset (as determined by increased alpha angle) in the setting of cam-type impingement (Figure 1).4 Pincer-type impingement may be associated with a crossover sign, coxa profunda, and an increased center-edge angle (CEA). Advanced imaging stud-

Figure 1. Anteroposterior radiograph of pelvis in 17-year-old girl with cam lesions of proximal femurs (white arrows).

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Sex-Based Differences in FAI Incidence

Traditionally, it was thought that cam-type impingement occurred predominantly in young, athletic males, whereas pincer-type impingement resulting from acetabular overcoverage occurred primarily in females during their fourth decade. However, our understanding of the sex-based differences in the incidence and presentation of FAI has evolved, and it is now clear that the interplay of sex, radiographic signs of impingement, and development of symptoms requiring treatment is more complex.

In recent large population-based studies, investigators have attempted to better characterize the sex-based differences in the incidence of osseous FAI deformity. Gosvig and colleagues examined radiographic and questionnaire outcomes of 3620 patients (age range, 21-90 years) and found that males were more likely than females to have a pistol-grip deformity of the hip (19.6% vs 5.2%); that deep acetabular sockets were common in both sexes (15.2% vs 19.4%); and that the presence of pistol-grip deformity or deep socket was significantly associated with development of osteoarthritis, independent of sex.

In a study of 2081 asymptomatic patients (mean age, 18.6 years), Laborie and colleagues reported similar radiographic findings. Males were significantly more likely than females to have a cam-type deformity, as evidenced by pistol-grip deformity, focal prominence of the femoral neck, and/or flattening of the lateral aspect of the femoral head. Males were also more likely than females to have a pincer deformity, though radiographic signs of pincer deformity—a crossover sign, excessive acetabular coverage (defined by increased CEA), and a posterior wall sign—were common in both sexes, occurring in 16.6% of females and 34.3% of males. Bilateral findings of FAI-associated deformity were also more common in males than in females, both for cam-type deformity (24.7% vs 6.3%) and pincer-type deformity (21.7% vs 9.7%).

Sex-Based Differences in FAI Presentation

In males and females, the clinical presentation of FAI is similar—insidious onset of deep groin pain, often exacerbated with activity, and physical examination findings of decreased hip motion (particularly internal rotation) and a positive impingement test. Nevertheless, the sexes’ clinical presentation differs in several ways. Specifically, in a study using 3-dimensional CT to assess bony deformity in both symptomatic and asymptomatic patients, Beaulé and colleagues reported that alpha angles were significantly higher in symptomatic males than in symptomatic females (73.3° vs 58.7°). Hetsroni and colleagues recently reported similar results in a study of 217 symptomatic young adults treated arthroscopically for hip pain. Preoperative CT showed that alpha angles were significantly larger in males than in females (63.6° vs 47.8°).

The authors postulated that females may be more likely to be symptomatic in the setting of smaller cam lesions because of the increased peak hip flexion and frontal plane motion commonly demonstrated by females during drop landings in sport. The authors further hypothesized that sex differences in muscle mass (which contributes to dynamic hip stability) and ligamentous laxity (a component of static hip stability) may result in larger physiologic ranges of motion for many females. As a result, bony impingement may occur in the setting of smaller anatomical lesions in females. The authors further noted that, compared with their male counterparts, females being treated for symptomatic FAI had significantly more femoral and acetabular anteversion.
Another male–female presentation difference involves symp-
tom bilaterality. Specifically, males are significantly more likely
than females to have symptomatic FAI involving both hips. In
a recent study of 646 patients who underwent hip arthroscopy
for symptomatic FAI during a 2-year period, Klingenstein and
colleagues\(^4\) found that females constituted 48.2% of unilateral
arthroscopy patients but only 34.8% of bilateral arthroscopy
patients. The odds ratio of males treated for both hips, compared
with females, was 1.7 (95% confidence interval, 1.16–2.54).

Last, it has been reported that, on clinical presentation, hip
function scores are significantly lower in females than in
males. In a recent study of 612 cases of symptomatic FAI
treated with hip arthroscopy, Malviya and colleagues\(^5\) found
that females had significantly lower quality-of-life scores both
before and after surgery. Hetsroni and colleagues\(^7\) reported
similar findings, with females having significantly lower pre-
operative modified Harris Hip Scores and lower Hip Outcome
Scores in the domains of Activities of Daily Living and Sports.

### Sex-Based Differences in FAI Treatment

Surgical treatment of FAI is focused on identifying the source
of hip pain and dysfunction—be it osseous lesion, labral tear-
ing, chondral injury, or iliopsoas tendonitis—and treating it
accordingly, regardless of sex. Most studies of this approach
find consistent improvement in the short-term and midterm
outcome scores for a majority of patients. However, relatively
few studies have focused specifically on sex in determining
the percentage of patients who require surgical treatment,
in deciding the type of surgery that should be performed,
or in measuring surgical outcomes in patients with symp-
tomatic FAI.

In their review of 23 studies of FAI surgery, Ng and col-
leagues\(^\text{,}^4,^5,^6,^9\) found that, of 970 patients, 608 (62.7%) were male
and 362 (37.3%) were female. Similarly higher rates for males
were previously published.\(^5,^11\) More recently, Clohisy and collec-
tues\(^1,^2\) reported on the descriptive epidemiology of patients
having surgery for FAI at 8 different medical centers in North
America. Fifty-five percent of the hips surgically treated for
symptomatic FAI were females. The authors speculated that
this unexpectedly high rate could have resulted from US and
Canadian female athletes’ increasingly higher level of sports
participation. The results of this study, one of the largest
examining the rate of surgery for males and females with
FAI, suggest that females are more likely to have surgery for
symptomatic FAI despite being less likely to have radiographic
evidence of impingement. Our understanding of this phe-
omenon continues to advance.

In a recent prospective study, Krych and colleagues\(^13\) evalu-
ated the clinical outcomes of FAI surgeries (labral débride-
ment, labral repair) in an all-female patient cohort. Female
patients with symptomatic FAI were randomized to undergo
either labral débridement or labral repair. There were clinical
improvements in both groups, but, compared with labral
débridement patients, labral repair patients had more sig-
nificantly improved Hip Outcome Scores in the domains of

### Conclusion

Femoroacetabular impingement is a common clinical en-
tity that affects both males and females. However, sexual
dimorphism in FAI incidence, presentation, treatment, and
outcomes has recently been described in the literature (Table).
Being aware of these sex-based differences and tai-
loring patient evaluation and management accordingly will
likely result in optimal outcomes for each person who pres-
ents with symptomatic FAI.

<table>
<thead>
<tr>
<th>Table. Main Sexual Dimorphisms Associated With Femoroacetabular Impingement (FAI)</th>
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<tbody>
<tr>
<td>Males are significantly more likely than females to have radiographic cam-type FAI.</td>
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<tr>
<td>Males are significantly more likely than females to have symptomatic bilateral FAI.</td>
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<tr>
<td>Alpha angles are significantly smaller in females with symptomatic FAI than in symptomatic males.</td>
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<tr>
<td>There is significantly more hip anteversion in females with symptomatic FAI than in symptomatic males.</td>
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<tr>
<td>On clinical presentation, hip function scores are significantly lower for females than for males with symptomatic FAI.</td>
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Activities of Daily Living and Sports, as well as better subject-
ive outcomes. Although the study did not compare female
patients with male patients, it does provide evidence that
female patients specifically may benefit more from labral
repair than from labral débridement alone.

With respect to different surgical treatments for male and
female patients, Hetsroni and colleagues\(^7\) introduced the idea
of sex-specific treatment when they noted more hip antever-
sion in their study’s female patients than in its male patients.
They suggested that, because the anterosuperior acetabulum
is subjected to a high amount of stress during weight-bearing
and gait, this area in females with suspected pincer lesions
should be rim-trimmed judiciously to avoid increasing the
stress and perhaps even hastening the development of degen-
erative disease. Last, though several authors have noted that
hip function scores are lower in females than in males on pre-
sentation, it has also been reported that females demonstrate
more improvement in functional scores after surgery.\(^2\) This
may be important information to discuss during preoperative
counseling about expected goals and outcomes.

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