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Sex-Based Differences in the Clinical Presentation of Patients With Symptomatic Hip Labral Tears

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Investigation performed at American Hip Institute, Chicago, Illinois, USA

Background: An increasing body of literature describes the clinical presentation and demographics of patients with hip labral tears. The differences in pelvic structure and joint laxity between sexes have been described; however, no study has evaluated differences in the clinical presentation of patients with symptomatic labral tears between sexes.

Purpose: To describe the differences between sexes in demographics, clinical history, physical examination, and intraoperative findings in patients with symptomatic labral tears.

Study Design: Cohort study; Level of evidence, 3.

Methods: Data were prospectively collected between February 2008 and February 2013 on 1401 patients who had symptomatic labral tears and underwent arthroscopic surgery. Hips with previous pathologic disorders were excluded. Data on demographics and clinical history were gathered, and a physical examination was performed. Preoperative pain was estimated on the visual analog scale (VAS), and 4 hip-specific patient-reported outcomes (PROs) were administered to evaluate functional status. Intraoperative findings were recorded.

Results: A total of 654 patients met our inclusion/exclusion criteria, with 320 males and 334 females. The median age for males was 38.3 years (range, 15.0-69.6 years) and for females 40.4 years (range, 13.1-66.8 years). Male patients had a higher incidence of acute injury than females (39.6% vs 27.6%, respectively; $P < .05$) and a higher incidence of workers' compensation status (14.1% vs 4.5%, respectively; $P < .05$). Females had increased range of motion compared with males, which was statistically significant for all range of motion measurements ($P < .05$). The anterior impingement test was positive in 94.4% of females and 92.9% of males, the flexion/abduction/external rotation test was positive in 59.5% of females and 61.5% of males, and the lateral impingement test was positive in 55.0% of females and 59.2% of males, but there was no statistically significant difference between sexes in any of the tests. Pain with palpation over the greater trochanter was positive in 22.0% of males and 36.9% of females ($P < .0001$). Females had lower PROs; however, VAS scores were similar.

Conclusion: Male and female patients differ in their hip structure, biomechanics, and operative findings of symptomatic labral tears. However, they do not differ substantially in clinical presentation, except that males are more likely to report an acute injury and females are more likely to be evaluated with increased range of motion.

Keywords: hip; sex; arthroscopy; labrum

Male and female patients differ in their physical and behavioral characteristics. These differences have been shown to affect many aspects of injury incidence and outcomes. For example, female basketball and soccer players have a 3 times increased incidence of anterior cruciate ligament (ACL) injury compared with males.¹⁶ The anatomic features of the hip and the sex-based differences in these features have been researched and described. These studies have found that women have increased acetabular version,^{11,13,15} increased femoral anteversion,¹⁵ and decreased

lateral center-edge angle.¹⁵ In a recent study, Hetsroni et al⁸ reported on sex-based differences in hip morphologic characteristics in young adults with hip pain and labral tears. The investigators reported that females have smaller alpha angles and increased anteversion. In addition, Johnson et al¹⁰ reported that males develop thicker femoral necks with advanced age, which might lead to increased incidence of femoroacetabular impingement (FAI) in male patients over the years.

Given the data accumulated with regard to differences in pelvic anatomic features between sexes and the relationship between the bony architecture and labral tears, we hypothesized that there will be a difference in the clinical presentation between males and females with symptomatic labral tears. The objectives of this study were to add

to the current knowledge of symptomatic labral tears and to address sex-based differences in the clinical presentation of symptomatic labral tears.

MATERIALS AND METHODS

Between February 2008 and February 2013, data were prospectively collected on all patients undergoing hip arthroscopy by the senior surgeon (B.G.D.). The inclusion criteria for this study were preoperative hip pain associated with a labral tear diagnosed on magnetic resonance imaging (MRI), hip arthroscopy with labral treatment (repair or debridement), and consent to participate in the study. The exclusion criteria were previous hip conditions such as fractures, Legg-Calve-Perthes disease, slipped capital femoral epiphysis, avascular necrosis, and any inflammatory diseases or connective tissue disorders. Any patients with additional pathologic disorders that might influence the clinical presentation (such as gluteus medius tears, snapping hip, trochanteric bursitis, and iliopsoas bursitis) were excluded from the study.

Objective data such as sex, age, height, weight, body mass index (BMI), duration of symptoms, and failure to improve with physical therapy were also collected. This study received institutional review board approval.

Physical Examination

A detailed physical examination was conducted on all hips before surgery, including passive range of motion (ROM) measurements of flexion, abduction, and internal and external rotation. Internal and external rotations were measured while the patient was in the supine position with both the hip and knee flexed at 90°. Tenderness was assessed with palpation over the greater trochanter, and an impingement test of the hip and gait analysis was also performed. The examination was performed in a clinical setting, and ROM was evaluated by manual physical examination performed by a senior surgeon and documented in degrees.

The protocol included presurgical administration of 4 hip-specific questionnaires: the modified Harris hip score (mHHS),³ the nonarthritic hip score (NAHS),⁴ the Hip Outcome Score—Activities of Daily Living (HOS-ADL), and the Hip Outcome Score—Sport Specific Subscale (HOS-SSS).¹² Patients were also asked to estimate their pain on a visual analog scale (VAS) from 0 to 10, where 0 was considered to be no pain at all and 10 was considered to be the worst possible pain. Scores were recorded at the preoperative visit.

TABLE 1
Demographics

| | Male Patients | Female Patients | <i>P</i> |
|--|------------------|------------------|----------|
| No. of hips | 320 | 334 | |
| Right/left hip, No. | 177/143 | 176/158 | |
| Median age (range), y | 38.3 (15.0-69.6) | 40.4 (13.1-66.8) | .98 |
| Average weight, lb | 196 | 151 | <.05 |
| Average height, inches | 71 | 65 | <.05 |
| Average body mass index | 27.4 | 24.9 | <.05 |
| Receiving workers' compensation insurance, % | 14.1 | 4.5 | <.05 |
| Active in sport, No. of cases | 123 | 116 | .36 |

Indications for Surgery

Indications for surgery were severe pain interfering with activities of daily living and failure to respond to nonoperative treatments associated with pathological findings on MRI.

Surgical Technique

All arthroscopies were performed in the supine position. Cam and pincer lesions were corrected under fluoroscopic guidance, with femoral osteoplasty and acetabular osteoplasty, respectively. Labral tears were refixed when possible or selectively debrided until a stable labrum was achieved.

Intraoperative data included the presence and size of concomitant labral tears, ligamentum teres tears, and any additional intra-articular pathologic lesions, and whether patients underwent procedures such as microfracture.

Statistics

Descriptive statistical analysis was performed with Microsoft Excel (Microsoft Corp, Redmond, Washington, USA) and SPSS Statistics version 20 (IBM Corp, Armonk, New York, USA).

RESULTS

Demographics

During the study period, a total of 654 hips underwent arthroscopic treatment for symptomatic labral tears, 320

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TABLE 2
Clinical History

| | Male Patients | Female Patients | <i>P</i> |
|---------------------------------|---------------|-----------------|----------|
| Median duration of symptoms, mo | 12 | 14 | .81 |
| Back pain, % | 26.0 | 21.6 | .2 |
| Acute injury, % | 39.6 | 27.6 | <.05 |

TABLE 3
Range of Motion

| | Male Patients ^a | Female Patients ^a | <i>P</i> |
|-------------------|----------------------------|------------------------------|----------|
| External rotation | 45 (5-90) | 51 (10-90) | <.01 |
| Internal rotation | 19 (0-60) | 27 (0-90) | <.01 |
| Flexion | 115 (45-160) | 118 (75-150) | <.01 |
| Abduction | 42 (0-110) | 46 (20-80) | <.01 |

^aValues are expressed in degrees as average (range).

males and 334 females. The median age for males was 38.3 years (range, 15.0-69.6 years) and the median age for females was 40.4 years (range, 13.1-66.8 years). There were statistically significant differences ($P < .05$) between sexes with regard to height, weight, and BMI (Table 1). Average BMI for males was 27.4 (range, 19.2-48.9) and for females 24.9 (range, 13.5-48.7). There was no difference regarding laterality (Table 1). Workers' compensation cases represented 14.1% of the male cases and 4.5% of the female cases. Sport activity was reported in 123 males and 116 females ($P = .32$).

Clinical History

Median duration of symptoms was 12 months for males and 14 months for females, which was not a statistically significant difference. An acute injury was documented in 39.6% of the males and 27.6% of the females ($P < .05$). A history of back pain was reported in 26.0% of the males and 21.6% of the females ($P = .2$) (Table 2).

Physical Examination

Average ROM was inside the normal values for both sexes, with females demonstrating an increased ROM compared with males (Table 3). Gait evaluation revealed abnormal gait (antalgic gait) in 32.7% of the males and 32.3% of the females ($P = .92$) (Table 4).

Anterior impingement was positive in 92.9% of the males and 94.4% of the females ($P = .43$), the flexion abduction external rotation test was positive in 61.5% of the males and 59.5% of the females ($P = .63$), and the lateral impingement test was positive in 59.2% of the males and 55.0% of the females ($P = .3$) (Table 4).

Palpation over the groin elicited pain in 24.1% of the males and 32.5% of the females ($P = .1$), and palpation over the greater trochanter elicited pain in 22.0% of the males and 36.9% of the females ($P < .0001$) (Table 4).

TABLE 4
Physical Examination Findings

| Findings | Male Patients, % | Female Patients, % | <i>P</i> |
|---|------------------|--------------------|----------|
| Gait disturbances | 32.7 | 32.3 | .92 |
| Anterior impingement | 92.9 | 94.4 | .43 |
| Lateral impingement | 59.2 | 55.0 | .3 |
| Posterior impingement | 30.9 | 36.1 | .19 |
| Flexion abduction external rotation | 61.5 | 59.5 | .63 |
| Pain with palpation over greater trochanter | 22.0 | 36.9 | <.0001 |

TABLE 5
Preoperative Patient-Reported Outcome Scores

| Outcome Measure | Male Patients | Female Patients | <i>P</i> |
|--|---------------|-----------------|----------|
| Modified Harris hip score | 62.6 | 59.9 | .033 |
| Hip Outcome Score—Activities of Daily Living | 64.3 | 60.7 | .03 |
| Hip Outcome Score—Sport Specific Subscale | 42.3 | 38.6 | .06 |
| Nonarthritic hip score | 60.1 | 56.3 | .01 |
| Visual analog scale | 5.7 | 5.9 | .43 |

TABLE 6
Surgical Findings

| Findings | Male Patients | Female Patients | <i>P</i> |
|--|---------------|-----------------|----------|
| Labral tears, % | 100 | 100 | 1 |
| Labral tear size, No. of hours on clock face | 3.3 | 2.7 | <.001 |
| Microfracture, No. of patients | 54 | 30 | <.01 |
| Ligamentum teres tear, No. of patients | 181 | 188 | .94 |
| Femoral osteoplasty, No. of patients | 282 | 226 | <.001 |
| Acetabular osteoplasty, No. of patients | 239 | 240 | .41 |
| Traction time, min | 62.3 | 55.4 | <.001 |

The average VAS for males was 5.7 and for females 5.9 ($P = .43$). The average mHHS was 62.6 for males and 59.9 for females ($P = .033$) (Table 5).

The diagnosis of labral tear was confirmed by MRI in all patients before surgery.

Surgical Findings

During hip arthroscopy, labral tears were identified in all cases, with a mean labral tear size of 3.3 hours on the clock face for males and 2.7 hours on the clock face for females ($P < .001$) (Table 6). Labral tears were classified according to the Seldes classification system.¹⁷

Traction time was 62.3 minutes for males and 55.4 minutes for females ($P < .001$). Femoral osteoplasty was performed in 88% of males and 67.7% females ($P < .001$).

Acetabular osteoplasty was performed in 74.7% of males and 75% of females ($P = .41$).

Microfracture was performed according to the technique of Crawford et al⁵ in cases where exposed bone was present after the bony decompression at the surgeon's discretion. Microfracture was performed in 54 males (16.9%) and 30 females (9%) ($P < .01$).

DISCUSSION

This large series of 654 patients with a documented labral tear represents the first study in the literature to address sex-based differences in the clinical presentation and operative findings of symptomatic labral tears. We have found, as hypothesized, that males and females differ in the operative findings. However, there were no major differences in their clinical presentation, except that male patients were more likely to report a history of acute injury and females were evaluated with increased ROM.

Despite the major progress made in treating labral tears, diagnosis and understanding of presentation are still being defined. Delayed diagnosis remains common, and delayed treatment adversely affects outcome. Aprato et al¹ prospectively evaluated 525 patients undergoing hip arthroscopy for labral tears, FAI, or chondral damage, concluding that patients treated within 6 months of symptom onset had better outcomes at 3 years' follow-up compared with patients treated after longer periods of symptoms. Patients who had symptoms for more than 3 years had significantly poorer results, further emphasizing the need for timely diagnosis.

Knowledge and understanding of the clinical presentation of pathologic lesions are crucial to establish a timely diagnosis. In a benchmark study, Burnett et al² described the clinical presentation of 66 consecutive patients with labral tears. The investigators concluded that the clinical presentation of a labral tear may vary and that a labral tear should be suspected in young, active patients with insidious onset of groin pain. The investigators reported that 88% of subjects had a positive anterior impingement test and limitations in hip flexion and internal rotation. This was the first study to investigate the clinical presentation of patients with symptomatic labral tears. However, the study did not address any sex-based differences and had a relative small cohort of patients.

Historically, labral tears have been considered a traumatic event mostly as a result of acute hip trauma or as caused by repeated overload in the setting of hip dysplasia.^{9,18} Today, with increased understanding of hip biomechanical properties and advances in imaging modalities, labral tears are encountered most commonly in the setting of FAI deformity,^{6,7,18} implying that labral tears are strongly connected to the bony structure of the hip.

The normal hip structure differs between sexes,^{11,13,14,17} as females have increased acetabular version,^{11,13,15} increased femoral anteversion,¹⁵ and decreased lateral center-edge angles.¹⁵ Nakahara et al¹⁵ further evaluated the effect of sex-based differences in bony morphologic characteristics on ROM and impingement, reporting

significant changes between sexes regarding the ROM reaching impingement.

In a recent study, Hetsroni et al⁸ reported on sex-based differences in hip structure in young adults with hip pain and labral tears. The investigators included 249 hips in their study and performed computed tomography to evaluate the hip morphologic characteristics. They reported that females have smaller alpha angles and increased anteversion, concluded that cam lesion may be more subtle in females, and proposed that hip version analysis be conducted preoperatively.

Similar to Hetsroni et al,⁸ we have found that females have worse patient-reported outcome scores and have theorized that this could be caused by soft tissue laxity or differences in muscle mass and protective dynamic stabilization. However, Hetsroni et al did not provide patient-reported preoperative pain scores, which in our study were not significantly different between sexes, raising questions about whether this difference is maintained postoperatively and how it influences clinical outcomes. The sex-based differences in the hip structure and biomechanics combined with the strong correlation between labral tears and hip morphologic characteristics indicated a possible sex-based difference in the clinical presentation and surgical findings in patients with symptomatic labral tears.

Contrary to our hypothesis, there were no significant differences between the sexes in regard to their clinical presentation, except that males were more likely to report an acute injury and females were evaluated with increased ROM. We can attribute the lack of difference to the fact that the pain generator that is responsible for the clinical presentation was the labral tear, which was a common factor in both groups. However, there were differences in the surgical findings between the sexes; males had higher incidence of cam lesions as well as a higher incidence of high-grade cartilage damage requiring microfracture and larger labral tears. As previously mentioned, Johnson et al¹⁰ reported that males develop thicker femoral necks with advanced age, and this may explain why males had a higher incidence of cam lesions. The higher incidence of cam lesions might be the reason for the larger labral tears and higher incidence of chondral damage. The higher incidence of cam lesions might also explain the differences in the hip ROM.

Limitations

The present study had a number of limitations. The duration of symptoms was collected by subjective recollection of symptom onset by the patients themselves. There was no age-matched control group of patients with hip pain without labral tears. Therefore, it is difficult to describe a symptom as pathognomonic to this condition alone. We cannot exclude the possibility that the symptoms and signs were due to intra-articular pathologic lesions such as chondral damage or hip impingement. All the patients were diagnosed and treated by the same orthopaedic surgeon. Finally, we did not exclude patients who had microfracture performed during surgery. Microfracture and cartilage damage may affect clinical presentation; however, unlike

other conditions that were excluded (gluteus medius tears, snapping hip, trochanteric bursitis, and iliopsoas bursitis), cartilage damage cannot be accurately diagnosed preoperatively. Therefore, we opted not to exclude these patients from our study.

CONCLUSION

Knowledge and awareness of hip labral tears are increasing. A timely diagnosis is critical in preventing further cartilage damage and improving patient outcomes. Male and female patients differ in their hip structure and biomechanics as well as in the operative findings of symptomatic labral tears. However, contrary to our hypothesis, they do not differ substantially in clinical presentation, except that male patients are more likely to report an acute injury and females are more likely to be evaluated with increased range of motion. Understanding these differences may help facilitate a timely diagnosis and better patient care.

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