Demographic, Historical, and Clinical Predictors of Hip Microinstability: A Multicenter Cohort Study

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INTRODUCTION: Hip microinstability has emerged as an important, though often underrecognized, source of pain and dysfunction in young, active individuals. Unlike femoroacetabular impingement (FAI) or hip dysplasia, microinstability lacks standardized diagnostic criteria and is often diagnosed intraoperatively after other pathologies have been excluded. Improved preoperative identification using patient demographics, history, and reproducible physical examination findings may aid in clinical decision-making, guide surgical planning, and reduce diagnostic delays. This study aims to identify clinical predictors—including provocative physical exam maneuvers—associated with intraoperatively confirmed hip microinstability in a large, multicenter cohort undergoing arthroscopic hip surgery.

METHODS: Using prospectively obtained data, we retrospectively analyzed 802 hips that underwent arthroscopic hip surgery from 2021–2025 across three high-volume orthopedic centers that focus on hip preservation. Patients were categorized into two groups: those with and without intraoperative confirmation of hip microinstability. Data included patient demographics (age, sex), clinical history (symptom duration, mechanical symptoms, diagnosis of dysplasia, connective tissue disorders), and family history. Patients were queried about specific mechanical symptoms such as locking, catching, popping, and subjective instability. Physical exam tests were analyzed including: objectively measured hip range of motion, Impingement test, the Scour test, the Prone External Rotation (PER) test, the Abduction-Hyperextension External Rotation test (AB-HEER), the Hyperextension-External Rotation (HEER) test with and without anterior relocation, Axial Distraction test evaluating for pain and for Apprehension. Statistical analysis included t-tests for continuous variables and chi-square tests for categorical variables. Odds ratios (OR) with 95% confidence intervals (CI) were reported for significant findings.

RESULTS:

Of the 802 hips, 240 (30%) were diagnosed with microinstability intraoperatively. Patients with instability were statistically older (35.1 vs. 34.1 years, OR 1.02 [1.00–1.03], $p=0.017$) and predominantly female (77.9% vs. 38.8%, OR for male sex 0.13 [0.09–0.19], $p<0.001$). Instability was more common in right hips (59.2% vs. 50.4%, OR 1.48 [1.08–2.03], $p=0.016$) and those with a prior diagnosis of dysplasia (12.6% vs. 4.1%, OR 1.93 [1.02–3.69], $p=0.045$). For non-instability patients, more than half had a traumatic onset (50.4%). This is compared to instability patients, where the majority of cases were atraumatic (59.2%), however 40.8% still did report a history of trauma. Family history of dysplasia did not increase the likelihood of the diagnosis of microinstability (2.2%, OR 1.04 [0.33,2.76], $p=0.943$). Mechanical symptoms were significantly more common in instability patients, including popping (30.0% vs. 23.8%, OR 1.62 [1.11–2.35], $p=0.012$), catching (33.9% vs. 35.9%, OR 1.50 [1.02–2.21], $p=0.038$), and subjective instability (21.9% vs. 16.0%, OR 2.12 [1.39–3.24], $p<0.001$).

Mean hip flexion was notably higher in the instability group (117° vs. 108°, OR 1.04 [1.02–1.05], $p<0.001$), as was internal rotation in both seated (27.4° vs. 23.2°, OR 1.03 [1.02–1.04], $p<0.001$) and prone positions (32.8° vs. 26.6°, OR 1.04 [1.02–1.05], $p<0.001$). Seated external rotation was also increased slightly (38.2° vs. 34.5°, OR 1.01 [1.00–1.03], $p=0.018$).

The AB-HEER test, positive in 43.1% of instability cases vs. 23.6% of stable hips (OR 2.46 [1.72–3.53], $p<0.001$), demonstrated strong predictive value. The HEER with anterior relocation test showed a similar pattern, with 32.1% positivity in instability patients vs. 23.3% in controls (OR 1.66 [1.14–2.43], $p=0.008$). Notably, the Axial Distraction Apprehension test, although less frequently positive (7.0% of instability vs. 1.7% of stable hips), had the highest odds ratio (OR 4.33 [1.79–11.19], $p=0.002$), suggesting high specificity. Axial Distraction Pain also differed significantly (10.2% vs. 5.4%, OR 2.20 [1.17–4.11], $p=0.013$).

Classic hip examination maneuvers such as the Impingement test were paradoxically positive in the majority of both groups but remained significantly associated with instability (94.3% vs. 89.1%, OR 2.65 [1.41–5.34], $p=0.004$), possibly reflecting its sensitivity for intra-articular pathology and not specific diagnosis. Similarly, the Scour test was positive in 77.4% of instability cases vs. 74.3% of stable hips (OR 2.57 [1.45–4.81], $p=0.014$). The PER test (26.1% vs. 18.1%, OR 1.65 [1.11–2.46], $p=0.013$) provided moderate discriminatory utility.

DISCUSSION AND CONCLUSION:

This multicenter analysis highlights key demographic and clinical exam findings associated with hip microinstability. While female sex, dysplasia history, and mechanical symptoms are well-known risk factors, this study adds valuable data on the diagnostic value of specific physical exam maneuvers. The AB-HEER, axial distraction, and HEER tests emerged as particularly strong predictors, with axial distraction apprehension offering the highest specificity despite lower sensitivity. These findings suggest that a systematic combination of history, mechanical symptoms, and targeted physical exam tests may enhance preoperative diagnosis of instability. While it has been known that the "Impingement Test" is not

pathognomonic for FAI, this test, along with the scour maneuver, are both frequently positive for both hip instability and non-instability, suggesting that these are good tests for ascertaining intra-articular sources of hip pain, but not the specific etiology.

The broad range of findings observed in this cohort supports a multifactorial model of hip instability, combining elements of osseous morphology, soft tissue laxity, and dynamic instability. Our findings may serve as a foundation for developing a standardized clinical scoring system or diagnostic algorithm to guide future evaluation, referral, and treatment planning in this challenging population.