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Preoperative Symptoms in Femoroacetabular Impingement Patients Are More Related to Mental Health Scores Than the Severity of Labral Tear or Magnitude of Bony Deformity

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ABSTRACT

Background: The purpose of this study was to determine the relationships between patient factors, mental health status, the condition of the local tissue, magnitude of bony deformity, and preoperative symptoms in a series of femoroacetabular impingement (FAI) patients.

Methods: From our prospective outcomes registry, we identified 64 patients with arthroscopically-treated labral tears and cam deformities. We assessed the correlations between patient factors (age, sex, body mass index, level of education), surgical findings (size of labral tear, presence of chondral lesions), mental health factors (VR-12 mental component score [MCS], depression, and preoperative use of psychotropic and/or opioid drugs), magnitude of FAI deformity (alpha and lateral center edge angles), and preoperative hip dysfunction and osteoarthritis outcome score (HOOS) subscales. Patient factors, surgical and radiographic findings, and preoperative HOOS scores were compared between patients with low and high MCS.

Results: Neither hip pathology nor patient-related factors significantly correlated with HOOS scores. On the contrary, MCS significantly correlated with HOOS symptom ($\rho = 0.45$, $P < .001$) and pain scores ($\rho = 0.52$, $P < .001$). Low MCS patients had significantly lower preoperative scores for all 5 HOOS subscales ($P \leq .002$) and more frequent chondral lesions and comorbid depression ($P \leq .01$).

Conclusion: Symptom severity was significantly more related to mental health status than either the size of labral tear or FAI deformity. Patients with low MCS had significantly worse preoperative pain and self-reported function, and a greater prevalence of concomitant chondral lesions. Future studies are necessary to determine if earlier surgical treatment or preoperative psychological and/or pain coping interventions may improve outcomes for those with low MCS.

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Preoperative symptom severity has been previously reported to have a stronger connection with mental health status than actual structural pathology for both rotator cuff and knee osteoarthritis patients [1–5]. Although there is an established connection with preoperative symptoms, the relationship between mental health status and/or comorbid psychological disorders and symptoms

appears to persist postoperatively as well [6–8]. However, the relationship between mental health and symptom severity has yet to be identified in femoroacetabular impingement (FAI) patients. As such, the purpose of this study was to determine the relationships between patient factors, mental health status, the condition of the local tissue, and preoperative symptoms in a series of FAI patients. We hypothesized that preoperative symptoms would have a stronger relationship with preoperative mental health status than the severity of tissue pathology.

Methods

From our IRB-approved, single-surgeon, prospective outcomes registry, we identified 64 FAI patients with complete preoperative

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clinical data (51 women, 13 men; age = 34.3 ± 12.5 years, body mass index [BMI] = 25.7 ± 6.3 kg/m²). Patients were included in the current analysis if they had symptomatic labral tears, had failed conservative treatment (intra-articular corticosteroid injection and/or nonsteroidal anti-inflammatory medications, activity modification, and physical therapy), and subsequently underwent arthroscopic labral debridement or repair with femoral osteochondroplasty for the correction of cam deformity. Patients undergoing revision hip arthroscopy and those undergoing concomitant core decompression or open hip procedures were excluded. All procedures were performed by a single fellowship-trained, board-certified surgeon between August 2014 and April 2016.

Before surgery, patient factors were recorded including age, sex, height, weight, level of education, and working status. Preoperative radiographs were reviewed with the lateral center edge angle being measured from the anteroposterior radiograph to assess the magnitude of pincer deformity. In addition, the magnitude of cam deformity was assessed by measuring the alpha angle from the preoperative frog leg lateral radiograph [9]. Intraoperative findings and surgical details were routinely captured and included the size of the tear and the presence of moderate to severe chondral lesions at the time of surgery (Outerbridge grade 3 or 4) [10]. The size of the tear was estimated intraoperatively by using the standard clock face description [11]. The clock face description was then converted to degrees to estimate the size of the tear. For example, a tear noted to extend from the 12:00 to 4:30 position would equate to 135°. In addition, patients completed the hip dysfunction and osteoarthritis outcome score (HOOS) [12] and Veterans RAND 12-Item Health Survey (VR-12) questionnaires before surgery [13]. The HOOS is comprised of 5 subcomponent scores: symptom, pain, activity of daily living (ADL), sports and recreation, and quality of life (QOL) [12]. The VR-12 mental component score (MCS) was used to quantify preoperative mental health status [13]. MCS assesses the impact of emotional health on a person's daily life (ie, frequent depressive and/or anxious behavior, accomplished less than usual, limited the types of activities performed, had less energy than usual, or if their emotional condition has interfered with participation in social activities).

Statistical Analyses

Using preoperative data, the correlations between patient demographics (age, sex, BMI, level of education), injury specifics (size of labral tear, alpha angle, lateral center edge angle, and the presence of moderate to severe chondral lesions), mental health factors (preoperative VR-12 MCS), and preoperative use of psychotropic and/or opioid medications with each of the 5 preoperative HOOS subscales (symptoms, pain, ADL, sports, and QOL) by calculating Spearman rho correlations (ρ). Historically, correlation coefficients >0.5 are considered “large” [14]. For the present study, we then considered potentially clinically meaningful correlations to be those $\rho >0.50$. The magnitudes of correlations between the different patient and intraoperative factors with HOOS subscales were then compared using previously described methods [15].

Patients were also stratified into those with preoperative MCS in the bottom quartile (low MCS) and in the top 3 quartiles (high MCS), based on previously published normative values of the US population [13]. Patient demographics, level of education, size of tear, presence of moderate to severe femoral or acetabular chondral lesion (Outerbridge grade 3 or 4), concomitant depression, preoperative use of psychotropic medication, and preoperative opioid use were compared between groups using chi-square or Fisher exact tests, as appropriate. Continuous variables were compared between the MCS groups using Mann-Whitney *U* nonparametric tests. All

Table 1

Comparison of Patient Factors and Intraoperative Findings (Mean $\pm$ Standard Deviation or Number of Patients) With Low or High MCSs.

Variable	Low MCS	High MCS	P
N	25	39	-
Age, y	36.4 $\pm$ 14.6	33.0 $\pm$ 10.9	.36
Sex (F/M) ^a	16/9 (64% F)	35/4 (90% F)	.02
BMI, kg/m ²	26.4 $\pm$ 7.3	25.2 $\pm$ 5.7	.63
Depression (#) ^a	14 (56%)^a	1 (3%)^a	<.001
Preoperative psychotropic medication (#)	12 (48%)	9 (23%)	.06
Preoperative opioid use (#)	10 (40%)	8 (21%)	.15
Years of school completed	14.0 $\pm$ 2.2	14.9 $\pm$ 3.0	.21
Size of labral tear, °	80.9 $\pm$ 38.0	80.9 $\pm$ 41.1	.95
Alpha angle, °	67.0 $\pm$ 6.8	65.7 $\pm$ 13.2	.91
Lateral center edge angle, °	32.5 $\pm$ 5.2	30.6 $\pm$ 8.1	.16
Grade 3 or 4 chondral lesion (#)^a	12 (48%)^a	7 (24%)^a	.01

BMI, body mass index; MCS, mental component score.

Bold values indicate statistical significant differences between groups.

^a Statistically significant ($P < .05$).

analyses were performed using SPSS Statistics 22 (IBM, Armonk, NJ), with $P < .05$ considered statistically significant.

Results

Significant, potentially meaningful correlations were present between MCS and HOOS pain ($\rho = 0.52$, $P < .001$) and ADL scores ($\rho = 0.56$, $P < .001$). Although just below our target threshold of 0.5, MCS also significantly correlated with HOOS symptom ($\rho = 0.45$, $P < .001$), sport ($\rho = 0.44$, $P < .001$), and QOL scores ($\rho = 0.45$, $P < .001$). There were no correlations between any other patient or intraoperative factor and any of the HOOS subscales that exceeded the 0.5 threshold (range 0.001–0.35). Furthermore, the correlations between MCS and HOOS pain and ADL scores were significantly greater than all patient- and hip pathology-related factors ($P < .05$). Preoperative MCS was correlated with comorbid depression ($\rho = 0.55$, $P < .001$); however, MCS was significantly more correlated with preoperative pain ($P = .02$), ADL ($P = .02$), and QOL scores ($P = .04$) than patient-reported comorbid depression.

A disproportionate number of patients had low preoperative MCS (25 of 64, 39%) when compared with the general population. Although low and high MCS patients did not differ in terms of age, sex, BMI, level of education, the magnitude of FAI deformity, or the size of the tear (Table 1), low MCS patients more frequently had grade 3 chondral lesions at the time of surgery ($P = .01$) as well as more frequent comorbid depression ($P < .001$). Low MCS patients had significantly lower preoperative scores for all 5 HOOS subscales ($P \leq .002$, Fig. 1).

Discussion

The purposes of this study were to compare the relationships between patient factors, mental health status, the condition of the local tissue, and preoperative symptoms in a series of FAI patients. We hypothesized that preoperative symptoms would have a stronger relationship with preoperative mental health status than the severity of tissue pathology. The results, by and large, supported this hypothesis and have potential implications both for the diagnosis and treatment of FAI patients with symptomatic labral tears.

Similar to previous studies of rotator cuff and osteoarthritis patients [1–5], the severity of preoperative symptoms was significantly more related to mental health status than either patient factors or the condition of the local tissue in our series of FAI patients. Surgical indications typically involve physical examination and imaging findings, independent of mental health status. Radiographic and/or magnetic resonance imaging are used to

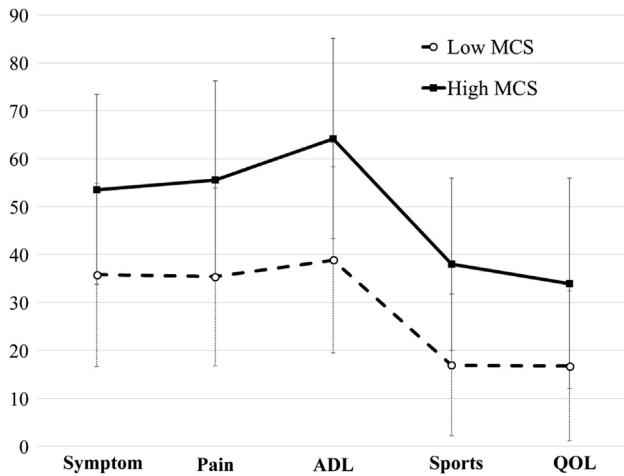


Fig. 1. The 5 subscales of preoperative hip disability and osteoarthritis outcome score (HOOS) were significantly lower ($P \leq .002$) in the group with low preoperative MCSs. ADL, activity of daily living; MCS, mental component score; QOL, quality of life.

identify the presence of labral tears as well as underlying bony deformity that may have played a causative role in the tear's development [16]. However, approximately 70% of asymptomatic volunteers have magnetic resonance imaging evidence of labral tears, with 37% demonstrating radiographic cam deformity [17]. Furthermore, radiographic FAI measurements are sensitive to pelvic tilt [18] and have limited interexaminer reliability [19], and both previous reports and the current results demonstrate that radiographic measures of FAI deformities are not associated with preoperative symptoms [20].

The disconnect between the condition of the local tissue, radiographic measures, and preoperative symptoms suggests that mental health status should be quantified as part of the routine preoperative evaluation in this patient population. The current results further suggest that the VR-12 MCS may offer an effective method to assess mental factors associated with increased symptoms and inferior postoperative outcomes. Consisting of 12 items, the VR-12 questionnaire can be completed in a timely manner and may provide a more accurate representation of the patient's mental status than traditional health history forms. As was seen in the present study, MCS was more correlated with preoperative HOOS scores than was patient-reported comorbid depression. First, depression was self-reported in our study, so it is unclear if the patient was diagnosed by a healthcare provider or self-diagnosed. Second, it has been previously reported that only one-third of orthopedic patients with depression report their condition on their orthopedic in-take paperwork [5], so it is likely that depression was generally underreported. Regardless of the underlying potential for depression being under-reported, implementing the VR-12 appears to be an effective and efficient method to quantify patients' mental status. Quantifying mental health status preoperatively may assist the surgeon in setting appropriate postoperative expectations for the patient, and potentially be used for risk stratification should mental health status be demonstrated to increase the risk of either postoperative complication or a prolonged recovery.

In addition to highlighting the need to preoperatively quantify mental status, the current results also have implications for the treatment of FAI-related labral tears. FAI has been identified as playing a key role in the etiology of hip osteoarthritis [21,22]. Specifically, labral tears have been suggested to be one of the first steps down the path to chondral breakdown and osteoarthritis [23]. Furthermore, it is the presence of arthritic changes, and not age, at the time of hip arthroscopy that are associated with inferior

outcomes [24]. Thereby, the increased prevalence of moderate to severe chondral lesions in the low MCS group may have clinical importance.

Our current correlational analysis is unable to determine a cause-and-effect relationship between the presence of chondral lesions and low mental health scores. We can only speculate as to whether inferior mental health scores are in response to a more chronic pain state or if mental health status is affecting pain perception and/or processing [4,25,26]. However, based on the progression described by McCarthy et al [23], those with chondral lesions in addition to a labral tear are likely more advanced in the spectrum of osteoarthritis. This is further reinforced by the significantly inferior scores observed across all 5 HOOS subscales for the subset of labral tear patients with low MCS.

Future large-scale studies are necessary to determine if earlier intervention may be beneficial for patients with the combination of FAI-related labral tears, chondral lesions, and lower preoperative MCS and/or HOOS scores. Earlier intervention may not only potentially eliminate the mechanical cause of chondral defects, but may also lessen the duration of pain. The longer that pain is present, the more likely central nervous system adaptations are to occur [25]. Pain centralization is a neurological process in which chronic nociceptive input creates prolonged hyperexcitability, thus increasing the patient's pain response to a given stimulus [25,27,28]. For those with FAI-related labral tears, correction of the bony deformity and treatment of the tear has been demonstrated to successfully reduce pain [29]. By removing the painful stimulus, pain centralization can be reversed; however, the longer the tear and deformity are left untreated, both the cycle of chronic pain and labral-tear induced degenerative changes may continue. As such, to protect against both degenerative chondral changes and neuroplastic alterations in pain processing, earlier diagnosis and surgical treatment are necessary. On the contrary, future studies are necessary to determine if adjunctive psychological and/or pain coping interventions can improve the success of conservative treatment of FAI-related labral tears for patients with low preoperative MCS.

This study was not without limitation. We are unable to determine if the associations between MCS and FAI symptoms persist after surgery as we did not capture patient-reported outcome scores during the early postoperative period in this series of patients. At the time of data collection, we routinely collected preoperative and annual postoperative outcomes as part of our outcomes registry. We have since included additional early time points to our registry data collection based on the current findings as well as the likely need to document early postoperative recovery as part of upcoming public reporting and pay-for-performance requirements.

In conclusion, mental health status more closely correlated with patient symptoms than did the size of acetabular labral tear or magnitude of FAI deformity in our series of FAI patients. Patients with low mental health scores (ie those who self-reported that their emotional health interfered with their daily lives) had significantly worse pain and self-reported function and a greater prevalence of concomitant chondral lesions. Although arthroscopic treatment of hip labral injuries has been previously reported to be a successful procedure in most patients, future study is necessary to determine if earlier surgical treatment or preoperative psychological and/or pain coping interventions may improve outcomes for those with low mental health scores.

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